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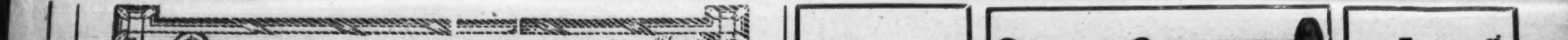

THE

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"FROM WHATEVER SOURCE AVAILABLE."

THE British Vice-Consul at Baku has reported upon the large demand there is, and will be, for internal-combustion engines of from 2½ H.P. to 100 H.P., for the oilfields. There is also an increasing demand for engines of the Diesel type for driving electrical power plant. Electrical power is being used on the oilfields more and more each year, both for drilling and for baling the wells, while the whole of the fields are lighted electrically. Electrically-driven pumps, lathes, and fittings for machine shops (not so heavy as the usual British types), and all sorts of other requirements are alluded to by Mr. McDonell. It is recognised both by him and by the Board of Trade, which gives publicity to the matter in its *Journal*, that on account of the difficulties of communication, and restrictions on exports during the war, there is little possibility of anything being done at present *except preparatory work*. "He, however, lays emphatic stress on the importance of such preparation, pointing out that as soon as communications re-open supplies *will have to be obtained at once from whatever source available*." We believe that industrial and trade students who try to avoid taking a narrow view of the outlook see that when fighting ceases, the whole of the nations, whether they have been at war or not, will be scrambling to secure their requirements for replacement and renewal work in industrial operations. We discussed this matter somewhat fully in a leader on "The Demand that will Follow" (ELEC. REV., February 25th, 1916). We then said, referring to the needs of Russia and other purchasers: "Will the character of British products be adjusted to meet their requirements? Will British manufacturing capacity be increased to any large extent? . . . The answer is emphatically in the affirmative, but will the capacity be sufficient to justify other nations in basing international trading policy upon possibilities in this direction? . . . We may be as anti-German in sentiment as the horrors of this war compel us to be, but the fact remains that, if in any country whatsoever other nations cannot suitably meet the requirements of purchasers, the trade will have to go to those who are in a position to do it, and who are not merely in that position from a manufacturing capacity point of view, but are eager to employ every possible means of adaptation and enterprise within their power, to attain that end." It is 18 months since we wrote thus. In that period, engineering manufacturing capacity of all kinds in these islands has greatly increased, but the difficulties in the way of export trade developments, whether for the Russian market or any other, have also increased, and the influences that will eventually control purchasers who experience an imperative demand for goods appear to be the same. German manufacturing facilities, so far as we are able to tell, appear to be pretty much what they were before the war, and immense efforts are being made to secure a renewal of trading relations with former markets.

We have done wonders in this country in many new and extended manufacturing operations, yet Mr. Hirst, at the meeting of the General Electric Co., Ltd., pointed out that the existing British electrical companies had

yet to make good a deficiency in output to cover the demand which in pre-war time was supplied by importation. It is clear, then, if our deficiency represented by the amount of our importation is not yet being made up, we have not yet prepared for the extra demand that will follow from the outside markets which will immediately call for electrical and engineering manufactures "from whatever source available." Mr. Hirst says that the re-organisation work awaiting our electrical companies after the war will be a tremendous task. A number of schemes for re-organisation, re-arrangement, co-operative working, and so forth, have been proposed, and some of them are taking practical and financial shape, but it is clear that much more requires to be done if we are to be strong and big enough electrically to do all the things that we aspire to do. We believe with many of our industrial leaders and engineers that the future for British electrical industry is wonderfully bright. Mr. Hirst summarised some of the facts and possibilities of the situation admirably. We hear of other proposals which will assist to make us stronger than we have been or are, and the opportunities that will present themselves will call for a vast amount of new capital to be brought to the aid of electrical manufacturing. The pity of it is that, knowing all of these things well as our leaders do, they find it necessary to tie our hands in many ways, either directly or indirectly, in consequence of war activities or restrictions, or of financial burdens, so that we cannot do things that we desire to do. It is as plain as anything well can be that necessity will dictate many courses of action that present sentiments may not approve because, as Mr. McDonell says, supplies "will have to be obtained at once from whatever source available." He may well lay "emphatic stress" upon the importance of preparatory work. Unfortunately, such preparatory operations are extremely difficult to proceed with amid the prevailing conditions. The directors of the General Electric Co., Ltd., in their report, stated that these conditions "had not enabled them to proceed with the preparations for the developments awaiting the electrical industry after the war." Other manufacturing concerns have been in a similar position, though some have indicated measures that they have been able to adopt. The fact is that the possibilities are so vast that the situation calls for operations of a far-reaching kind, or else we shall only reap a small fraction of the advantage that lies within our grasp, and that might be ours if we only had the kind and size of organisation that seems to be necessary.

H.M. Consul at Ekaterinburg has been reporting lately on the situation in the Urals. At first there was an outcry for British goods, and Russian merchants failed to understand the great difficulties that stood in our way in meeting their demand. They "seemed to think that British goods ought immediately to fill up the gaps left by the absence of German goods," but they were eventually forced to obtain supplies from Japan and the U.S.A. The result was that imports into the Urals from Japan, the U.S.A., and the United Kingdom stood in the proportion of 10, 5, and 2. Ural merchants have been glad to obtain even low-grade goods which they could sell on the empty markets at fabulous prices. For this reason, he adds, "it is difficult to form an idea at present of how the United Kingdom, the United States, Japan, and Sweden will fare in the competition for trade that must arise after the war." The United Kingdom difficulty is the greater, in his opinion, because British representatives have not been able to visit the country during the war to make a study of local conditions, without a knowledge of which successful trade with Russia is impossible. This is one of the measures of preparation that the electrical industry has been trying to make in a moderate way through existing organisations in spite of the unprecedented difficulties. Mr. Garvin has said lately that if the war were to end now it would be disastrous for us, because we are unprepared for what is to follow. The Government says that it appreciates the possibilities, and recognises that the difficulties that it is bound to put in the way of traders are a handicap, but it must have revenue. The longer the war lasts the more revenue it must have, and some of our measures by way of preparation may be still longer deferred. It is devoutly to be hoped that the nation, especially Labour, will grasp what some of these things mean and what they call for. Whatever the special features of the war settlement may be, the manufacturing character of the German people will remain. Then Russia, the near neighbour, free and democratised, but comparatively short of industrial manufacturing facilities of her own, will, as Mr. McDonell has said, and as M. Gurievitch also indicated in his article which was translated in the Electrical Review for February 25th, 1916, secure "from whatever source available" those things of which she is in need. She will not impose restrictions purely on the ground of sentiment if they are opposed to her own immediate industrial and economic interests. The sooner that we and the Allied countries, including now the U.S.A., can get ahead with that preparatory work the better will be our chances for being that "available source."

The Rôle of the Engineer.

From time to time the engineer, usually absorbed in his professional work, wakes up, looks round, and realises that there is another world besides that in which he habitually moves—the world, that is, of the "man in the street." With the organisation, administration, purposes, and triumphs of the engineering world he is familiar; in all these phases he plays a part, humble or distinguished as the case may be. But of the other world, the everyday world of the social organism, he recks little; its construction and operation are not subject to calculation and measurement, its motives are obscure or obviously fallacious, its components heterogeneous and disorderly—in fine, it is not congenial to his trained and ordered habit of mind, he is perhaps not a little inclined to despise it and its ways, and certainly he feels no over-mastering impulse to take part in its affairs.

But is he right in this? Modern civilisation is built up on an engineering foundation. In every department of life the influence of the engineer inevitably makes itself felt, though unrecognised by the vast majority. For lighting, heating, cooking, transportation, both of persons and commodities, water supply, sanitation, housing, agriculture, fishing, fighting ("this is an engineers' war")—the engineer is ultimately responsible, often jointly with his highly esteemed colleague, the chemist, who himself is often half an engineer. The functions of the engineer *quâ* engineer, therefore, are intimately bound up with human affairs; why should he rigidly confine his activities to professional paths? Is he not admirably fitted, by education, training, and intellectual ability, to take an effective part in the management of public business? Yet we very rarely find an engineer as a member of a municipal council, of Parliament, or of other public administrative bodies, which are consequently deprived not merely of the technical knowledge so essential to the conduct of public affairs, but also of the sober judgment and logical reasoning which the successful engineer must necessarily display in his profes-

sional work. This is not by any means the first time that we have touched upon this subject, nor will it be the last. We will not now pursue it further, but we recommend the perusal of the remarks of the President of the American Institute of Electrical Engineers, of which we give an abstract elsewhere in this issue, which admirably state the case for the participation of the engineer in the affairs of the nation, and show that it is not merely his right, but his solemn duty to bear his share of responsibility.

In the course of his address Mr. Buck referred to the formation of the Engineering Council of Civil, Mechanical, Mining, and Electrical Societies, representing some 30,000 engineers, who are thus organised for co-operation in all matters affecting their interests and for the creation of "an engineering public opinion." The importance of this movement can hardly be over-emphasised. The Engineering Council of our American Allies meditates no harm to ourselves, but it must not be forgotten that an equally powerful and, from our point of view, formidable Association has been formed in Germany; we gave particulars of the latter in our issue of May 11th, 1917 (p. 519), which show that the "Union of German Technical Institutions" embraces no fewer than 11 leading societies of engineers and chemists. Have our leaders given due attention to this important movement and to the influence which it may, and probably will, exert upon the course of events when Peace returns? To ignore its existence would be folly—but what are we doing to prepare our defence? Surely we cannot do better than follow the dual example thus placed before us, and lose no time in organising, not only the manufacturing industries of the country, but also the magnificent and unrivalled fund of engineering knowledge and experience at our command. Apart altogether from questions of warfare, military or industrial, the combination of our engineering forces is an object well worth attaining for many other weighty reasons.

Foreign Trade Intelligence.

In our issue of December 29th, 1916, we referred at some length to the recommendations that had been made by the Federation of British Industries respecting the proposed reform of the consular and commercial intelligence services. It would be interesting to know whether the Government has so far completed its own review of these and other recommendations as to be able to form definite conclusions regarding the measures which ought to be taken for ensuring the co-ordination and efficient operation of such services in the interests of British trade and industry. It has frequently been stated by those best fitted to form a practical opinion on the matter that it is most important that whatever improvements are introduced should be available, if at all possible, before the end of the war. The unwillingness of the Government to announce its policy occasions disappointment and no little disquiet in commercial and industrial minds. All our armour will need to be in fit condition for trade after the war in order that our colonial and international trade may be revived, maintained, and extended. The prospective labour situation on demobilisation will call for abundance of work and good wages for many years, and the financial burdens of the war cannot be carried unless we strengthen our industrial position, and if this Government or any other leaves measures unprepared which might go toward ensuring that state of affairs it will have much to answer for. We hope, therefore, that our leaders will soon feel able to announce that they are doing something along the indicated lines, that that something includes concentrated, in place of scattered, control at home, and an army of efficient industrial and commercial men located throughout the world as representatives of a strong Government Department. The war has placed heavy financial burdens upon our manufacturing concerns, and in a large measure their normal trade connections are suspended. It is surely due to them that their recommendations concerning things that the State might reasonably do to help them to recover their lost position should be heeded and, if possible, acted upon promptly—not dallied with. At least the reasons, if any, for their non-acceptance could be officially divulged.

ELECTRICITY SUPPLY IN PARIS.

As is tolerably well known, our French Allies are making strenuous and successful efforts in the direction of developing the large resources in water power which still remain unutilised in that country. This attitude is due largely to the necessities created by the war, particularly in view of the comparative scarcity of supplies of coal. Under existing circumstances, the hydro-electric works have been placed at an advantage as compared with the steam generating stations, which have suffered greatly from the shortage and dearness of coal as well as of other materials. A typical instance of the latter class is represented by the Compagnie Parisienne de Distribution Electrique, which practically has a monopoly of the supply in the French capital.

The report of the directors of this important company states that the continuation of the war rendered the distribution of electricity in Paris more difficult and more costly in 1916 than in the preceding year. As the demand for motive power on the part of the war industries experienced a considerable increase, the company endeavoured to meet it, as far as possible, in the interests of the national defence, the result being that the total turnover for lighting and power purposes exceeded 127,000,000 KW.-hours in 1916, as compared with 69,000,000 KW.-hours in the previous 12 months. On the other hand, the greatest troubles, among obstacles of every kind, were encountered in procuring coal for the company's two works; frequently only inferior coal was available, which was subject to enormous increases in prices, whilst, at the same time, there was always present the apprehension of a complete exhaustion of the stocks. How serious this matter became on one occasion is shown by the fact that with a daily consumption of 760 tons of coal, the quantity of the stocks distributed between the two generating stations at the end of 1916 did not reach 6,000 tons, or the equivalent of less than eight days' working. The labour question, too, proved to be one of great difficulty owing to the necessity for recruiting, as substitutes for skilled workers who had been called to the colours, a fresh staff of helpers who had to be selected from casual workers and men of foreign nationality, who were so incompetent that no fewer than 3,500 had to be engaged in order to maintain a regular effective of from 400 to 450 auxiliary workers.

The obligations assumed by the company under the concession were to supply and distribute electrical energy in Paris at maximum prices, which were not to vary between January 1st, 1914, and June 30th, 1940, to pay to the Municipal Council a rental in proportion to the gross receipts, and to redeem at the company's expense during the concession the costs of first establishment, which were nearly £8,000,000, and which were to be increased annually by an average expenditure of £68,000 for supplementary works.

Before the concession was accepted, the constituent elements of the cost price formed the subject of a minute analysis by representatives of the company and of the Municipal Council, and the only divergence of opinion related to the question whether the expenses for coal should be estimated at 16s. per ton or 19s. 2d. per ton. But if the fundamental suppositions which determined the agreement eventually arrived at were realised in times of peace down to the end of 1913 the case became quite different almost from the time the present company became the concessionaire. In fact, the war radically modified the situation.

As an illustration of this contention, it is mentioned that

the consumption of energy for private lighting, which exceeded 80,000,000 KW.-hours in 1913, declined to less than 51,000,000 KW.-hours in 1915 and to less than 45,000,000 KW.-hours in 1916, when the undertaking was hampered by administrative restrictions in the second half, whilst the public lighting has also been diminished by more than half the former amount. On the other hand, an augmentation has occurred in the use for power purposes, the growth having been from 10,000,000 KW.-hours in 1913 to nearly 82,000,000 KW.-hours in 1916. During this period the price of coal has gradually risen until it reached an average of £3 per ton in 1916, which has increased threefold the expenses which were provided for under this heading in the concession, without taking into consideration the advance in the other constituents which also share in forming the cost price. It is known that the situation will become graver in the present year, as the recent purchases of coal have only been possible at £4 12s. per ton, and the supply of energy for the national defence consequently threatens simply to result in a loss to the company if the present system is maintained. Under these circumstances of a complete reversal of the previsions made under the concession, the company thought it would be sufficient to appeal to equity in order to obtain compensation from the Municipal Council in some form or other, and without having to take advantage of the principles of law, recently issued by the Council of State, and accepted by a number of French Municipal Councils. A peremptory refusal, however, has been the only result, as the City of Paris, notwithstanding the reversal of all the conditions upon which the agreement was based, claims to be exempt from the consequences of it, and to preserve the right to receive the whole of a progressive rental which proceeds from 10 to 25 per cent. of the company's gross receipts. The directors have therefore felt constrained to institute an action to enforce their rights, and they have full confidence that their application will be successful.

It would appear that, under the circumstances of the present times, all the holders of concessions from the City of Paris have points of dispute with the Municipal Council, the Metropolitan Railway Co., and the Nord-Sud Railway Co. also having differences with this authority. Indeed, as the chairman of one of these companies recently remarked, the City of Paris desires all the advantages without, at the same time, participating in the risks—a point which will, doubtless, be borne carefully in mind in the case of any future concessions in the French capital which may be dependent upon the goodwill of the Municipal Council.

THE GARRETT PATENT ELECTRIC WAGON.

For some time past it has been known that Messrs. Richard Garrett & Sons, of Leiston, were embarking on the manufacture of electric vehicles, and it is with considerable pleasure that we describe and illustrate herewith the first commercial electric wagon turned out by their works, and supplied to the Great Eastern Railway Co.

This wagon has 3½ tons capacity, and is capable of travelling from 35 to 40 miles upon one charge of the battery, the average speed being eight to nine miles per hour.

We understand that the firm also have designs completed for a vehicle of the same description, but with a carrying capacity of 2 to 2½ tons, and a speed of 10 to 11 miles per hour, the mileage on one charge being 35 to 40 miles, as in the larger design.

The wagon illustrated enjoys the distinction of having been both designed and built in an English works, and is therefore somewhat unique. Messrs. Garrett are past-masters in the art of steam wagon building, and their experience has been turned to good account in this vehicle, in which both weight and friction have been reduced as far as practicable.

The well-known "Ironclad Exide" battery is employed, but the makers are quite prepared to fit any other battery that their customers may fancy; the battery is carried slung below the chassis frame, and is arranged in trays of a convenient size for handling, which can be withdrawn from either side of the vehicle with equal ease.

The chassis is arranged so that any type of body may be fitted, but the standard arrangement is a wooden platform supplied with either chock rails, fixed or hinged sides, and tailboard.

Garrett Electric Vehicle supplied to the Great Eastern Railway.

A single series-wound 8-H.P. motor is used, having an overload capacity of 300 per cent. for short periods, with transmission by an enclosed silent chain, running in an oil bath, to a countershaft containing the differential gear, and thence to the rear wheels by means of silent roller chains.

The countershaft is suspended from the chassis in ball and socket joints to obviate any chance of undue friction brought about by possible wringing of the frame when travelling upon very uneven roads. Both axles are of specially treated steel of a kind which Messrs. Garrett have proved by their extensive experience in steam wagon practice to be best suited to withstand road shocks, and the wheels fitted to them are of a minimum weight consistent with adequate strength; furthermore, they are all fitted with Timken roller bearings.

Two independent brakes are fitted, both of which act directly upon the hind wheels. The foot brake, for general use, is of the contracting band type, while the emergency hand brake is of the expanding type. Messrs. Garrett have adopted this system because the general practice of fitting the emergency brake to the countershaft has the defect that, if the chains to the rear wheels snap, the emergency brake is useless.

The arrangement of the speed controller has several unique features. It is of the drum type, rotated by a handle attached to the steering handwheel, and gives six speeds in a forward direction, and four in the reverse. The controller is fitted with Messrs. Garrett's patent trip gear, which is so designed that so soon as either foot or hand brake are applied, the controller, which is carefully balanced, flies back to the neutral position automatically, and is so arranged that it is impossible to start the vehicle without first returning the controller handle to the neutral position and also releasing the brakes. This arrangement prevents damage being done by a heavy rush of current through the battery or motor, owing to the driver omitting to bring the controller handle to neutral before applying the brakes, as the act of applying them does this for him; also, if his brakes are applied, he is bound to release them before he can start to run. Furthermore, it obviates the risk of accidents which have occurred through a vehicle starting forward the moment the brakes are released when the controller has not been in the neutral notch.

Great attention has been paid to the lubrication of the working parts, and lubricators have been fitted at every point where, by doing so, friction can be reduced, and roller or ball bearings have been fitted throughout.

This has resulted in a vehicle that requires only a fraction above a quarter of a horse-power to drive the complete mechanism at average road speeds.

Some data as to the working of this vehicle, recently quoted in the *Commercial Motor*, covers 22 working days, during

which 307 tons were carried on 100 journeys; 965 deliveries of goods were made, over a working time of 245 hours. The all-in cost per ton carried was 1s. 11d., while the cost of horse transport on a similar basis would have been nearly 2s. 9d. per ton.

We are indebted to Messrs. Richard Garrett & Sons for particulars of their vehicle.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING MAY AND JUNE, 1917.

The official returns of electrical exports and imports for the months of May and June, show, as regards the exports, totals of £346,317 and £367,520 respectively, which compare with £308,514 in April and £404,586 in March, and are quite up to the average. The imports totals for the same months have been :—March, £286,921 ; April, £235,985 ; May, £236,799 ; and June, £186,888, showing a falling off in value. During the last three months machinery export values have steadily improved, while machinery import values have pursued the opposite course ; in addition, the importation of glow lamps has dwindled to very small proportions, though an increasing business is being done in imported "arc lamp parts."

The exports for May and June included submarine telegraph and telephone cable to the value of £3,322 and £14,240 respectively ; some £2,000 worth only of telegraph cable entered this country from abroad during the above months.

It is unfortunate that the official export figures for the above months contain unenumerated material (electrical goods and apparatus and machinery), representing over 25 per cent. of the total export values given, and one wonders what the effect on values the proper classification of these "unenumerated" species would have.

Exports and Imports of Electrical Goods and Machinery, May and June, 1917.

	Exports (May).	Imports (May).	Exports (June).	Imports (June).
	£	£	£	£
Electrical goods and apparatus unenumerated	62,717	47,244	53,580	35,727
Insulated wire and cable (not telegraphic or telephonic)	35,121	2,826	56,404	2,304
Electric glowlamps	12,073	444	9,999	1,773
Arc lamps and parts (not carbons)	1,442	10,071	14,035	15,967
Meters and instruments ...	4,972	3,749	14,419	3,511
Electrical machinery (including switchboards and transformers)	122,270	137,025	134,096	102,663
Batteries	13,237	18,256	10,486	17,009
Carbons	5,964	11,984	241	5,108
Telegraph and telephone wire and apparatus	88,521	5,200	74,260	2,826
Total	346,317	236,799	367,520	186,888

AIR-BLAST RECTIFICATION OF HIGH-TENSION CURRENTS.

That a partial rectification of a high-tension alternating current occurs on the passage of a discharge from a point to a plate has been known for many years. However, difficulty has been encountered in attempting to utilise this rectification, particularly if any considerable current flows, as a heavy arc then results which rectifies but little.

In the June, 1917, issue of the *Physical Review*, E. R. Wolcott and C. J. Erickson relate the results of an investigation into the effect of a blast of air on this discharge. It was found that complete rectification and smooth operation could be obtained by means of a current of air flowing from the point to the plate under such conditions.

When rectification occurred the discharge was white, rhythmic and snappy, as distinguished from the coloured arc which resulted when no air was flowing. Difficulties were encountered when trying to operate at too low voltages, say, only a few thousand volts, since a certain voltage is required to jump the air gap. Likewise, there is a drop in voltage across the rectifier in actual operation. Satisfactory rectification has been obtained up to 350 kv., and also at frequencies up to 500 cycles per second.

With the point inside a glass tube the discharge is more snappy, but the tendency to surge is greater. In this case aluminium electrodes seemed preferable, a larger plate was necessary, and a greater air pressure was required. With the point outside the tube, satisfactory results were obtained with iron and brass electrodes.

As the air pressure increases from zero during the discharge, the rectification increases to a maximum, the value depending upon the setting of the electrodes and the diameter of the air outlet. A further increase of air pressure beyond the value which gives maximum rectification produces irregular operation.

In general, the wave of the rectified current follows the wave form of the generator, but as a certain voltage is required to start the discharge, it does not include the whole half wave produced by the alternator. Furthermore, the rectified wave is more abrupt than the original wave.

The experiments were conducted with the apparatus illustrated in fig. 1. A pointed metallic electrode E is mounted co-axially

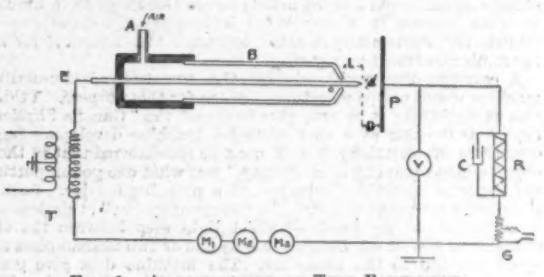

Fig. 1.—Arrangement of Test Equipment.

within the tube B, which is restricted at one end, so that air entering at A is blown through the opening O toward the plate P. Rectification occurs when the point is some distance within the tube, at the opening of the tube, or extending some distance outside of the tube, as shown. In the first two cases, the tube B must be made of some insulating material, as of glass ; in the last case, it may be of metal.

Mounted for use, this rectifier was connected to one terminal of the secondary of a 2-kw., 40,000-volt transformer T, the other terminal being grounded. The positive current flows from the point to the plate, and no discharge results in the opposite direction when the distance between the point and plate, that between the point and air outlet, the air pressure and the voltage are suitably adjusted.

Connected between the other terminal of the transformer and the ground were three milliammeters ; M_1 was of the electro-dynamometer type ; M_2 was a direct-current instrument of the D'Arsonval permanent field type ; M_3 was a hot-wire instrument.

The secondary voltage from the plate P to ground was measured by an electrostatic voltmeter. An oscillograph was connected directly in the high-tension circuit between the water resistance R and the ground.

The air condenser C consisted of 11 plates 8 ft. by 3 ft. (2·44 m. × 0·91 m.) and 8 in. (20·3 cm.) apart. Its capacity was

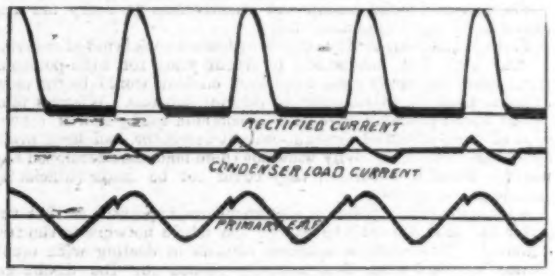

Fig. 2.—Rectified Current obtained with Air-blast Rectifier and Load of 104 Milliamperes.

0·00095 mfd., and it was connected in parallel with the water resistance when desired.

The diameter of the plate P should be large enough to prevent a discharge from the point to its edges. In the arrangement here described its diameter was 4 in. (10·16 cm.). The diameter of hole O in the tube B was 0·157 in. (4 mm.) ; *d*, the diameter of the metallic electrode E, was 0·0625 in. (1·57 mm.) ; L, the distance between the opening O and the point of the electrode E, was 0·375 in. (9·54 cm.) ; D, the distance between the plate and the point, was 0·68 in. (1·76 cm.). The frequency of the alternating current was 60 cycles per second.—*Electrical World.*

Mexican Electrical Taxes.—H.M. Chargé des Archives at Mexico City reports that Decrees were issued, under date June 5th, by the President of Mexico, imposing special stamp taxes on electric lights and telephones. The tax on electric lights has been fixed at 10 cents (Mexican gold) per month for each light up to 40 watts, and 10 cents extra for each light in excess of that power. Telephones in private houses are to be taxed at 50 cents, and in shops, offices, &c., at $1 (Mexican gold) per month. These taxes are to be collected through the companies supplying the services.—*Board of Trade Journal.*

D

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Electroculture.

I am glad to see that your recent report of the Board of Agriculture experiments and my article on electroculture have aroused so much interest in a new and, I believe, very important use of electricity. Particularly I wish to thank Mr. Turnbull for his favourable comment on my effort.

A correspondent asked whether the Armstrong hydro-electric machine would not be a useful generator for this purpose. I think this is doubtful; it is true that books of the "Ganot's Physics" type describe this as a very powerful machine developing large quantities of electricity, but it must be remembered that in those days "a large quantity of electricity" was what one got on putting the knuckle near the discharger of a pint Leyden jar. Such a machine is spoken of as giving "a torrent of sparks"; this does not describe the roaring patch of violet light seen between the dischargers of a W.T. set, even when only one or two milliamperes are being supplied to the condenser. The machine does give great potential, but I believe the quantity is doubtful and erratic. The action depends on the steam getting condensed at the right moment, and the nozzles wear under the impact of the particles of water.

Perhaps the most important point against it is the starting-up trouble. The charge is wanted on the wires for a short time once every 12 hours, and therefore the machine would have to be warmed up every time, or else stand-by losses incurred for about 20 hours out of 24. This would put coal and coke firing utterly out of court, and even a paraffin-fired flash boiler has to take up a large quantity of heat into the mass of metal, brick and water before it can begin to give off steam at from 80 to 100 lb. per sq. in. Then it has to deliver only 4 to 5 B.TH.U., and is shut down for another 10 hours, when it all begins over again!

Mr. Turnbull speaks of static machines, but I think he will find the efficiency low. Makers are very shy about speaking of the output of their machines as regards current—they are emphatic as to their spark length and many excellencies, but under pressure generally admit that the current is "very hard to measure," *i.e.*, is too small for a cheap moving-coil pivoted instrument. Certainly a machine that gives 1 milliampere at a 6-in. spark length—*i.e.*, 100 watts—is a big machine, and takes fully 1 H.P. to drive it.

The limit to the potential given by a static machine is the rate at which the induced charge leaks away over the surface of the plate; this increases rapidly with the potential, and finally equals the rate of increment, when no further rise in potential can take place.

This leakage and the friction, not only due to bearings, but largely windage, make the efficiency very low.

Their fragile construction and sensitiveness to damp are also severe handicaps in practical use.

Perhaps the most telling-argument against both types of machine is the need that has arisen in recent years for high-potential generators. In many cases a constant current would be far more suitable than an alternating or intermittent one. Wireless telephony would probably have been in common use by now if a good type of high-potential constant-current generator had been available some years ago. Why were not these machines developed and used? Because, I believe, they could not be made sufficiently powerful and reliable.

A most important point in electroculture apparatus is that the generator should be able to charge the whole network to the full potential. This means a machine capable of dealing with much greater outputs than that actually needed for the discharge, especially as there is always considerable insulator leakage to overcome. Trying to run a small generator up to its limit on this work has been responsible for many failures.

The Writer of the Article.

Recruiting and Dilution of Labour.

Admitting the difficulties attending recruiting and dilution of labour, the two following incidents alone show not only what managers of factories have to endure, but also the incompetence or stupidity of the Government representatives.

We are an engineering firm, controlled, scheduled under protected occupations, doing nothing but Class A and B work, most of which is direct Government work. We have only one electrician left in our factory, and he carries out all the testing, comprising insulation resistance, capacity, copper resistance (bridge and potentiometer methods), and extra-high-pressure by means of a motor-generator and transformer up to 50,000 volts. Moreover, he is responsible for the light and power installations of the factory, amounting to some 300 H.P.

In our returns we rate this man as "skilled." The Dilution Officer, with his superlative wisdom, disagrees with us, the man is to be called to the Colours, and provision for a male substitute is not approved. We were warned that this man would probably be called up, and at our invitation the Dilution Officer visited the works, and was shown the various instruments, the nature of the work, and the names of the Government Departments for which the work was required. At the same time, the serious results of the loss of this man were pointed out—it would mean shutting down, because no substitute could possibly be obtained. Did the Dilution Officer modify his views? No, he rose superior to such trifling consequences. He could then, he no doubt thought, get more men if the factory had to close. Far-seeing man—bump of perspicacity abnormally developed. We have no doubt as to the result of our appeal.

The second case relates to dilution, and we believe is not uncommon. Amongst substitutes sent us by the Labour Exchange was one to take the place of a married man with one child. This substitute, 26 years of age, unmarried, perfectly healthy, was found, after a few days, to have been imported from Ireland by the Government. The natural result is, of course, that the men are to "down tools" unless this Government nominee is dismissed. He will be in a day or two, and without a blessing. Do we express surprise at such outrages? We live on them—they are meat and drink to us. What should we have to do if the Government officials deprived us of these pleasantries?

Carry On.

Captive Balloons and Lightning.

From time to time I hear of this class of balloon being set on fire, while the non-captive, though not altogether immune, is seldom struck. My object in writing is to ask if any of your readers who heard of the destruction of the kite balloon at Roehampton, reported in the *Daily Telegraph* of July 14th, can give particulars of the accident. Was lightning seen to actually strike the fabric or was the gas (the inlet is, I believe, left open) set on fire by a flash in the vicinity?

Are these balloons connected to "earth" under service conditions?

Killingworth Hedges,

Hon. Sec. Lightning Research Committee.

St. Stephen's Club,
Westminster, *July 25th.*

The Psychology of Power-House Shift Work.

It is most refreshing to read such a sympathetic article on shift work as that in your issue of this week, more especially as the writer says he was formerly on shift work. Our experience has been that the men who are fortunate enough to leave shift work promptly forget the men they leave to do it; and it is a rare thing for a chief engineer who has done shift work, as so many have, to make any attempt to alleviate the discomforts of the shift worker. If we take the case of two men in the same employ receiving equal salaries and doing equally valuable work, we find that if one of these men is on shift work, in addition to inconvenient hours, he works more hours per week than the man receiving an equivalent salary, but who is in the office or some similar post. Why is this?

We are in full agreement with your writer as to the psychological effects of night shift and long hours, and think that a 48-hour week should be the maximum for shift workers, and no shift should last longer than eight hours.

Your contributor states that now is the employers' opportunity to improve conditions; but, in our opinion, the employer will do nothing to improve the lot of shift men unless pressure is applied. The question then arises, how is the pressure to be applied? If we look at things as they are at present in the industrial world, we find the employers banded together to protect themselves by Associations, Federations, and the like; the workmen are united in their Unions; but the *salaried* staffs of minor officials—such as shift engineers, draughtsmen, and so on—have no joint policy; thus they get what is left—usually small salaries and long and inconvenient hours.

We are not members of any organisation; but we are forced to the conclusion that no improvement in the shift men's lot will be made until they have banded together and shown that they speak as one man.

We can substantiate the statement of your writer as to the loyalty of station staffs, and also as to the unrest among them. They will never strike, of course, but employers should realise that a contented and comfortable staff is a great asset in the conduct of any business, and that unless they see to it that the staff is well treated, the good men will keep away and the business will suffer through the inferior quality of its staff.

The up-to-date employer pays his employés as much as he can afford, and not as little as he is allowed to do, with corresponding results in quality and output of work.

Shiftero.

July 23rd, 1917.

Mr. Arnold's very excellent article (published in your issue of July 20th) on the psychology of shift work, touches a matter of extreme importance to the future of power station work. It is well thought out, and comes particularly opportunely from a man who has himself got clear of that rotation of working hours at once so irritating, and so injurious to one's social life and digestion. There is, however, a reference made to the A.E.S.E., in which he entirely misses the mark. To state that the A.E.S.E. apparently collapsed because "it began to meditate militant tactics, thereby proving the loyalty of shift engineers to their employers," is quite erroneous. The great difficulty of the A.E.S.E. was that it had to cater for two distinct classes of men:—(*a*) Those who were paid by the hour, and regarded their work merely as a job, expecting nothing better than to get more money; and (*b*), those who were on the staff, and lived in hopes of a chief engineer's position, or

something approaching it. The former were out for Trade Unionism unadulterated, the latter (usually staff men) held aloof for many reasons, chief of which was that it was *infra dig.* to belong to any organisation whatsoever. Hence the A.E.S.E., refusing to cater for the former element, fell into abeyance for want of support from the latter.

Now, as one who has spent the greater part of his working life on shift work, I may say that the true position to-day is this :—The Trade Union element are fast joining the E.T.U. They believe that nothing short of a pistol at the chief's head in the form of a threatened strike can be effective. They are in receipt of the Committee on Production awards, each four months, to meet the increased cost of living, and for them the E.T.U. is an excellent thing.

Now it is these war wages paid to station men in the E.T.U. that are creating the discontent so rife amongst station men of the *infra dig.* class. They cannot see why they do not get the same consideration as the Union men, and will not see that their employers care nothing about their so-called loyalty.

They have not realised yet that employers are not paying the Committee on Production war wages because they want to, but because they are forced to pay all members of the Trade Unions affected by war conditions, hence membership of the E.T.U. gets it for station men.

It is difficult for staff engineers to join the E.T.U. along with the men working under them, and I would suggest two courses open to them :—(1) They can revive the A.E.S.E., calling it the Association of Electrical *Staff* Engineers, and invite members from all electrical engineering works, private and municipal ; or (2), they can invite the E.T.U. to form a section for staff engineers. Organise they must, if they are ever to be considered in the industrial conditions of the future.

A. O. Holt.

Manchester, *July 30th*, 1917.

Symbols for Electrical Tenders.

The ordinary formula for the present value of an annual expenditure is—

$$a = y\,[1 - (1 + b)^{-n}]/b.$$

If b is taken to represent the *mean* rate of interest for money borrowed and money invested, this is simply the formula which has received the approval of the Sydney Municipal Council, as mentioned in your "Notes" for July 27th last.

Norman Hockley.

Manchester, *July 30th*, 1917.

LEGAL.

Gas Light and Coke Co. *v.* Hackney Borough Council.

On Wednesday, July 25th, Mr. Justice Astbury gave his judgment in this case. He said : The question of principle which is raised in this action is one of far-reaching importance to the electric light undertakings of this country and to their customers. One of the principal objects of an electrical undertaking is to utilise its plant to the best advantage, and one method of accomplishing this result is to obtain customers for energy during the day as well as during the dark hours, and in each case to encourage customers whose hours of consumption do not synchronise, so that the diversity between them enables the plant to satisfy a greater number of hours of maximum demand than would otherwise be the case. The proportion of the actual number of units sold to the output capacity of the plant is termed in this branch of industry the load factor of the station, and the ratio between the load actually observed at the station and the sum of the loads at the consumers' terminals is termed the diversity factor. Broadly stated, power users have a better load factor and diversity factor than light users, which accounts for their being usually charged a low rate, because, other things being equal, the higher the load factor the lower the cost per unit of production, and the better the diversity factor the further the undertakers can go in the earning of revenue. An increase of the load and diversity factors, therefore, is of the greatest importance, and tariffs should be framed in order to obtain customers and classes of customers whose consumption contributes to this result. This being so, as a general rule it is obvious that a customer or a class of customers with a higher load factor, due to the taking of a different supply in different circumstances, is entitled in the interests of the undertaking to differential treatment in the matter of charges, as compared with the customer or class of customers whose load and diversity factors are inferior. The sections of the Electrical Lighting Act of 1882 which are in question are Nos. 19 and 20. These sections say nothing about and do not draw any distinction between light, heat, or power users as such. The station turns out only one class of energy, which is measured in Board of Trade units, and the dissimilarity of circumstances and the non-correspondence of supply involved in Sec. 19 must be looked for not in the difference in the energy consumed or in the manner in which it is led into and distributed by wiring and meterage in the customers' premises, but in the circumstances of the customer, in so far as they react on the supply that he takes and on the time, diversity, and quantity of consumption. In other words, the purpose to which the customer puts his energy which he purchases, whether for lighting, power, or heating, is, *per se*, irrelevant. It is in the quantum of and the circumstances in which he takes his supply of the one product that the undertaking offers for sale that the answer to the question as to undue preference must be looked for, and it is only for the purpose of classifying customers according to this test that they are for convenience divided into light, power, and heat classes, such purpose involving, as I have already pointed out, well-recognised differences from the point of view of load factor, diversity factor, and the quantity of units purchased. Customers may therefore be, and are, in practice divided into classes in accordance with those considerations, and they are charged with varying and different rates, and classes of rates, with the object of encouraging advantageous customers, and classes of customers, as well as of attempting to fairly adjust the respective advantages obtained by the station from all of them. This has led to what are termed different systems of supply being adopted, that is to say, for lighting, heating, power, &c., the customers in each case taking the only thing that the undertakers had to sell, but in circumstances which affect differently the load factor of the station in both diversity and quantity. If the different systems of supply are fairly arrived at, and are at the choice of the customer, and a preference prohibited by Sec. 20 as between customers dealing in similar circumstances, and not between customers dealing in different systems of supply, either of which they are free to select, is given, and to the extent that customers under one system benefit the undertaking in the way I have described to a greater degree than customers under another—so they are given a benefit in the scale of charges. In the present case, although the wording of the 1914 circular of the defendants, on which the action was launched, may be ambiguous in the sense that the 20 per cent. for light in the case of the power users was not expressly stated to be limited to factory lighting, this was put right in the circular and scale of charges issued in 1916, before the date of the writ, and in practice the defendants have not allowed a user of the 20 per cent. in question for purposes other than the lighting of a factory or workshop having a power supply, nor had they threatened, or intended, to do so, nor apparently has anybody thought that such was the case, and I allowed an amendment of the pleadings raising the 1916 circular in order that the case might be determined, and it has accordingly been argued, on the true facts. In the case before me, all power users are placed on the same basis if all take one supply at the same rate or price per unit, and they are all allowed to use 20 per cent. of such supply for lighting their factories or workshops, which must be lighted by some means or other if they are to take power supply at all. A similar practice has been sanctioned by Parliament in the case of many power companies, as explained in the evidence ; that is to say, Parliament has sanctioned power companies competing with lighting companies in various districts on the terms that one-fifth of the supply taken by the power user may be used for light, this being based on the footing that factory and workshop lighting, as a rule, does not amount to, or exceed, one-fifth of the total amount of the energy taken. For the reasons that I have endeavoured to give, I am of opinion that no breach of the provisions of Sections 19 and 20 of the Act of 1882 by the defendants has been established, and that they have not threatened or intended to supply energy otherwise than in accordance therewith. The action must be therefore dismissed, with costs against the plaintiffs.

His Lordship, on the application of Mr. Percy Wheeler for the plaintiffs, granted an extension of the usual time for entering an appeal.

M'Erlean *v.* Johnston.

In this case, heard at the Belfast Assizes, a soldier sued Stanley Johnston, electrical and general engineer, Belfast, for having exposed his son, J. G. M'Erlean, to unnecessary risk at Inver Bleach Works, Larne, where defendant had an electrical wiring contract, in September, 1916. It was stated that as a result the youth, aged 17, who was an apprentice to electrical engineering, met his death by being caught in machinery.

The Defendant denied that the deceased had at the time referred to been employed by him as an apprentice ; that he knew any part of the work he had contracted to do was to be done in proximity to dangerous machinery or that it was dangerous by reason of such proximity ; that he ordered the deceased to execute the work, or that he knew, or ought to have known, that the deceased was inexperienced and ignorant of the danger. It was further contended by him that there was contributory negligence, and that, admitting the work was dangerous, the deceased knew the risk and voluntarily undertook it.

His Lordship decided in favour of the plaintiff, and awarded £150 damages.

A stay of execution was granted.

First Aid in Factories.—The Home Secretary announces that he proposes to make an Order, which will take effect from October 1st next, requiring that all factories employing 25 or more persons, which belong to one or other of the following classes—blast furnaces, copper mills, iron mills, foundries, and metal works—shall provide and maintain "First Aid" boxes or cupboards. In the case of factories employing 500 or more persons, an ambulance room and ambulance carriage will have to be provided.

WAR ITEMS.

The Rebuilding of Belgium.—We have received from Technical Journals, Ltd., 27-29, Tothill Street, Westminster, a 36-page pamphlet, entitled "The Chance for British Firms in the Rebuilding of Belgium." It has been written by a "Belgian Contractor," and deals thoughtfully and informingly with many of the considerations that need to be borne in mind in connection with the immense reconstruction operations that will one day—may it be soon—have to be carried through in Belgium. Unquestionably, one of the first essentials will be money, and the wholesale devastation and robbery that have afflicted the country will render reliance upon outside sources imperative. The author shows that Belgium looks to this country to furnish the necessary capital. Germany occupied a predominant place in the building industry there before the war, and by close study of requirements, by low prices, and by instalment payment systems, secured a large trade. We shall have to meet German competition on its own basis, and unless we are prepared to thus compete, Germany will again secure a footing, and notwithstanding present Belgian intentions to have no dealings with the enemy which has caused so much misery and ruin, Belgians "will be driven against their will into the hands of German manufacturers supplying materials and plant at the lowest prices, and on the most advantageous terms." British firms are advised to study the specifications governing public works in Belgium for information respecting the materials used in construction. It is pointed out in the author's summary that our merchants and manufacturers who wish to supplant the Germans must not rely upon the quality and appearance of their products, but must, as the Germans have done before them, make their goods exactly in conformity with the Belgian official requirements. Building plant has been destroyed or stolen by the Germans, and the works and factories for producing materials that were formerly made by the Belgians themselves are no longer in existence. Belgian law is stated to provide every protection for British firms supplying goods on credit to Belgian contractors. The matter is surveyed in the following brief chapters:—Finance; Machinery and Equipment; Material Supplies; Construction; Commercial Organisation. In conclusion, the writer believes that British ingenuity and enterprise will be equal to the occasion, but our firms are urged to prepare themselves for the work, and to beware of the insidious commercial and industrial methods of the Germans. For three terrible years Belgium has been in the grip, or under the heel, of the Hun. We trust that the time of deliverance will not be long deferred, but whether that be so or no, it is the Allies' determination that ultimately there shall be restoration. What the future will bring, beyond that great fact, must necessarily be under a cloud for the present, but "Belgian Contractor's" contribution is undoubtedly a timely one, which all who wish to take part in that restoration should thoughtfully study.

An Appeal on Behalf of our Sailors.—An appeal has been issued by H.R.H. the Duke of Connaught on behalf of King George's Fund for Sailors. The safety of our shores and the maintenance of our food supplies, indeed, the existence of the Empire, depend upon the endurance and self-sacrifice of "those who go down to the sea in ships," and the nation has an opportunity of showing its appreciation of their services in a practical manner by supporting this new Fund, which was recently inaugurated at a meeting at the Mansion House. His Majesty has consented to become Patron of the Fund, and the Duke of Connaught is president. Contributions may be sent to King George's Fund for Sailors, Trinity House, London, E.C. 3.

Entertaining the Wounded.—On July 18th, a number of wounded soldiers were entertained by the employés of the Siemens Wotan Lamp Works, Dalston, N.E. This is another of the series of events arranged for by the Dalston lamp-makers, at their own expense. On this occasion the committee decided on a brake trip to High Beach, and two representatives of the employés were deputed to accompany the party (in two brakes from the Metropolitan Hospital), so that everything possible could be done for their enjoyment. Smokes were provided, and a substantial meal was served at Rigg's Retreat, High Beach. The following committee were responsible for the arrangements:—Miss Crisp, Miss Payne, Miss Fox, Miss Ashton, Miss Ross, Miss Cole. Mr. Price acted as secretary.

Exports to China.—The "London Gazette" for July 31st contains a further list of bodies and persons in China to whom exports may be consigned.

Exemption Applications.—At Calcutta Exemption Tribunal, in May, the application of Mr. Wingfield, agent for the Calcutta Electric Supply Corporation, on behalf of 54 assistants of the company, was under consideration. Mr. Wingfield withdrew his application on behalf of 12 of the men, but applied for absolute exemption for the rest. He wished to know whether the men would be considered to be under the military authorities and whether they would be liable to be called up at any time. If such was the case, it would interfere with his work, and would perhaps cause a cessation of the activities of his company. It was pointed out that should a contingency arise it was always open to him to represent the matter. A member of the Tribunal remarked that the military authorities were not so unreasonable as to take away a large number of his assistants, and so handicap his business. The President assured him that the men while on parade would be under the orders of the military authorities, and at other times under his orders. They were, however, liable to perform guard duty. In the end, 10 were selected for general service, and the applications on their behalf were withdrawn. Thirteen were exempted from all service up to the end of the year. Seventeen were exempted from general service up to December 31st, but are to perform general service training, special arrangements to be made for their drills. Several more were made liable for local service, and the applications of two were struck off.

At Southwark, Coun. T. E. Hewitt, electrical engineer, applied for the exemption of three sheet metal workers and a fitter. He stated that he had again applied for certificates under the protected trades schedule for these men, but had not got them. He had visited the Minister of Munitions, and seen the manager in charge of the badge department, who informed him that they were unable to deal at once with the large number of applications for badges that had been sent in. In one case a firm was asking for 100 cards. His application would be dealt with in due course. A further month's exemption was granted.

At the same Tribunal, Messrs. F. W. Hotton & Co., electrical engineers, applied for the exemption of F. W. Hotton, son of the principal, 26 years old, married, passed for garrison duty at home (C 1). They were entirely engaged on work for the Government and controlled firms. His son served his apprenticeship with the firm, and was now in charge of over 20 machines, his wages being £4 a week. The Military Representative thought they had better apply to the Minister of Munitions for a card for him. Mr. Hotton replied that they had already put in an application, but got no reply definitely, only a letter that the matter would have consideration. A month's extension was granted to obtain the card.

Conditional exemption was given at Ramsbottom to an engineer (28), Class A, in sole charge of electrical plant. He served in France, and was discharged in 1915.

At Bury, an electrical fitter, in charge of dynamos, motors, &c., at a paper mill (20, single), Class A, was ordered to report on October 1st.

At Burnley, an electrical fitter, aged 20, Class A, was found to be on work of national importance, and was exempted to September 30th.

Temporary exemption to October 31st was given at Clayton-le-Moors to an electrician, 31, general service, who said he was the only electrician in the township.

An electrical firm appealed, at Burlye, for an electrical fitter. Skilled men, it was urged, were very scarce. The men, who was 29, and B 1, was given to the end of September.

At the Burnley Tribunal, last week, the Military Representative asked for the review of the exemptions given to 46 motormen in the employ of the Corporation tramways. The Town Clerk said the cases were in respect of men who recently put themselves out of employment by striking, but they were now back at work. Captain Parker said the application for review had nothing to do with the strike. Twelve men were in category A, nine in B 1, and four in C 1, and he asked that these 25 should be directed to join the Army, after time had been allowed for them to settle their affairs and for the Corporation to find substitutes. Mr. H. Mozley (manager of the tramways) asked that the cases be adjourned until the full list of tram employés was brought up. The Tribunal decided that the time was not opportune to review the cases, and they dismissed the Military appeals. They would be prepared in the near future, however, to consider the whole list, if necessary.

The cases of 12 employés at the Eastbourne Corporation Electricity Works again came before the Tribunal last week. The Tribunal decided that the exemption certificates of nine of the men should be confirmed, and that the cases of three stokers in high medical categories should be adjourned for three months to see if they could be substituted.

Messrs. Marbro, Ltd., applied to the Fulham Tribunal for the exemption of Mr. W. A. Robertson (39, married, passed B 1), their works manager. It was stated that the company was formed in 1914 for the purpose of making electrical switches, &c. A large quantity of these goods was formerly imported from Germany. The directors, it was said, had businesses of their own, and took no part in the management. The firm was engaged on Government contracts. Mr. Robertson, who is a special constable and a member of the V.T.C., was awarded four months' exemption.

A review was made at Watford of the case of J. W. Russell (32, Class A), electrical fitter and engineer. It was urged that this was a one-man business, and, after particulars had been given of work done and in hand, the Tribunal withdrew the conditional exemption as from October 18th.

At Bexhill-on-Sea, Mr. H. T. Squirrell appealed for J. F. Gibbs, electrician, and six months' exemption was allowed.

At Weymouth, continued exemption was sought by Messrs. Brooking & Co., electrical engineers, for H. J. Barrow (34, Class A), wireman, and the firm defended a

military review of exemption held by A. Smith (32), wireman. The Advisory Committee expressed the opinion that the work of an electrical wireman could be done by a joiner or carpenter, and Mr. C. H. Wood (Military Representative) mentioned that the military were in urgent need of electricians. Mr. Escott (for Messrs. Brooking & Co.): Why don't they take on carpenters and joiners? Barrow was exempted whilst in the same occupation, and in the case of Smith, his exemption was varied to September 30th (final).

Rochdale Tribunal has refused exemption to J. Hilton (39, Class A), tramway motor examiner, and he is to report for service on August 31st.

Before the Somerset Appeal Court, Mr. A. J. Howard, borough electrical engineer at Taunton, applied for conditional exemption for W. P. Short (28, B 1), ledger clerk and relief switchboard attendant. Mr. Howard presented a card from the Ministry of Munitions, which the Chairman said protected Short from being called up, except with the sanction of the Munitions Area Tribunal. Mr. Howard said that the calling-up notice served on Short did not bear the authority named. The Chairman said that the proper course was to dismiss the appeal, and leave the matter to the Munitions Area Tribunal. Mr. Howard had better notify the Recruiting Officer that he held a protection card, and that the man's notice did not bear the proper stamp.

The Military had a review at Watford of conditional exemption held by Mr. M. G. Connari (37, Class A), electrical engineer. The case was heard *in camera*, and the exemption was cancelled, respondent to join up on September 1st.

At Broadstairs, the cases of four of the staff of the Isle of Thanet Electric Traction & Lighting Co. were gone into, those concerned being a permanent-way engineer and three motormen. Mr. Forde, manager, said that the men were indispensable to the working of the undertaking, and were all in certified occupations. He offered to release higher category men if and when the military authorities could provide him with efficient substitutes. The Military Representative asked if it would be possible to release some men by substituting a 20-minute service for the present one of 15 minutes. Mr. Forde replied that if any reduction of that kind became necessary, the directors would probable close the system altogether. Each of the men was granted conditional exemption.

At Ilfracombe, with the assent of the Military, exemption until October 1st was granted to A. H. Friend (33, Class C 3), electrical engineer.

Before the Beds. Appeal Court, the Military appealed against conditional exemption held by E. W. Keech (40, B 2), engaged with Messrs. Siemens laying cables from a power house to an aerodrome. The firm claimed the man as being thoroughly good at his work, and the Court granted conditional exemption whilst he remains in Messrs. Siemens' employ or in similar work of national importance.

The Essex Appeal Court heard a Military appeal against exemption held by five motormen engaged on the Leyton U.D.C. tramways. Captain Howard said that none of the men were now in certified occupations. Mr. Schofield (tramway manager) said that he had been trying to get substitutes, but after being in training for a month the men tried suddenly found they could not do the work. If he had another two months he thought that he could find men to replace these. Two months were granted in each case.

The Military appealed at Oxford against three months' temporary exemption granted to A. M. Eldridge (29, general service), electrician. The appeal was allowed, and a month's grace conceded.

At Quarry Bank, Messrs. J. Stevens & Co., of Thorns, appealed for an electrician (27), and three months were conceded.

At East Ham, an appeal was filed by R. Cornwall (22, C 2), electrician, who said that, owing to an accident, he had lost the fingers of his left hand, which was practically useless. A member protested against the appellant being called up, and Lieutenant Dundas replied that, as an electrician, he would be useful in the Army. Coun. Mitchell: They would put him on picking up paper, or something worse, whereas he is doing good work in civil life. Conditional exemption was granted.

At Winslow, an electrical engineer, dissatisfied with his classification (C 2), asked for leave to go to the Central Medical Board, saying that he could not walk a mile. Captain Green said that applicant need not worry about his inability to march; if he were a skilled electrician the Army would be only too glad of his services in that capacity. The application was refused.

On the recommendation of the Advisory Committee, the Rochdale Tribunal has granted exemption until October 31st to H. Smethurst (36, Class A), overhead wireman, appealed for by the Corporation Tramways Committee.

At Llangollen, in the case of Mr. G. F. Evans, engineer to the Electric Light Co., it was complained that he had not complied with the condition that he should join the V.T.C. The secretary to the company, Mr. I. Thomas, said that the drills were arranged in the evening, when the engines were running. Mr. Evans was the only expert in the locality, no one else could do his work, and he contended that he was better engaged where he was than in the V.T.C. The Tribunal continued exemption on Mr. Evans remaining in his present occupation.

TAR OIL FUEL AND DIESEL ENGINES.

In the discussion on Mr. Geoffrey Porter's paper before the Diesel Engine Users' Association (Elec. Rev., July 13th), Mr. G. W. F. Horner, in a communication, said that, in view of the very small percentage of insoluble matter which existed in the tar oil, it seemed difficult to account for the excessive deposit which took place in the pulveriser. He believed that a resultant-gas analysis would be most helpful, as his brief experience of this class of fuel had led him to think that they must regulate the air supply and relatively adjust the clearance to suit the required compression. At present the air supply was constant, or approximately so; the fuel supply depended upon the load and the action of the governor, and incidentally on the state of the pulveriser and needle valve. When the air supply was right for the amount of fuel to be burned at a certain load, then, it seemed to him, the lighter the load the more the air would be in excess of requirements; hence, an impoverished state of combustion (this characteristic was very noticeable in oil-fired furnaces), and was it not due to this condition of air supply that the pilot ignition was made use of? The question of storage in cold seasons was an important one; he believed that a simple agitator of the paddle type would be sufficient for storage tanks made from old boilers. Keeping the tanks warm had a decided advantage in maintaining a uniform temperature of the oil in stock, but if the heating was done with the waste gases from the engines, the outside of the tanks would need to be specially treated, as the acids formed in the gases were very active when combined with moisture and in contact with plain metallic surfaces.

Mr. F. W. Strickland, in a communication, said he found that his two engines drove their alternators in parallel as steadily as when burning crude, if the amount of ignition oil was about doubled (the larger amount being 1 gal. per hour for a three-cylinder 150-B.H.P. engine) by advancing the control lever a little, but they were very unsteady with the normal quantity of ignition oil, although when running on the same load separately they appeared to fire perfectly. He had found starting on tar oil most unreliable, and liable to cause very heavy explosions, and now always shut down on crude, so as to prime for the next start.

Mr. J. M. Ferguson, in a communication, said that the suitability of the fuel seemed to depend chiefly on the insoluble contents. With regard to flash point, his experience was that this might be in the neighbourhood of 90 deg. C. (194 deg. F.) without causing the slightest difficulty. It was found during the course of tests at his works that tar oil could be used as ignition oil with satisfactory results down to 1/4 load. His experience was that the quantity of ignition oil need not exceed 5 per cent. of the weight of ordinary fuel oil used at full load. Possibly under regular running conditions it might be advisable to increase this slightly, say, to 7 per cent. Had Mr. Porter tried running the engine for, say, five minutes on paraffin before stopping, with a view to getting rid of the deposits in the pulverisers and passages? The fuel consumptions given seemed very low, as a consumption of .66 lb. per KW.-hour at three-quarter load on a set of this size would be less than .44 lb. per B.H.P.-hour, which would be a good figure with residual petroleum.

Mr. H. S. Russell gave the result of the further experience which his firm, as manufacturers, had had during the past 18 months. It was regrettable that the price of tar oil had increased lately, and he was afraid that was due, not so much to the demand for the tar oil as to the fact that many different people had approached the tar distillers independently with a view to obtaining the oil, and so had given the distillers exaggerated ideas as to its value. It did not follow that because a particular design of pulveriser gave satisfactory results with a particular class of tar oil, it would be equally satisfactory with other tar oils. Their object with the pilot ignition system was to make it applicable to any standard engine with a standard pulveriser without having to make special alterations to suit varying classes of fuel oils. With regard to specifications of tar oil, he did not agree that it was important to keep the percentage of matter insoluble in xylol as low as German specifications required; a good deal depended upon the constitution of the insoluble matter. The insolubles were merely foreign matter—generally free carbon, dirt, brickdust, scale off boiler sides, &c. These must not be confounded with ash, which was, of course, the unburnt residue after the combustible foreign matter had been burnt. His firm had run engines satisfactorily on tar oil which contained as much as 8 per cent. of free carbon, but would not recommend so high a percentage. He considered Mr. Day's figure of 2 per cent. of matter insoluble in xylol quite a reasonable one, and as much as 5 per cent. might not be objectionable provided it was combustible. He thought Mr. Porter attached too much importance to the question of sulphur. While a high coking residue usually meant carbonising of the piston tops and exhaust valves, this was the only trouble, and it was not necessary to reject oils on this account. Mr. Day's figure of 3 per cent. was probably too low, but it should ensure an exceptionally good oil. Anything in the neighbourhood of 10 per cent. was too high, but the oil would not be unusable. He did not think that the flash point need be much considered, as it was no real indication of the composition of the oil. He confirmed Mr. Porter's

statement that the overall thermal efficiency when working with tar oil was slightly higher than with petroleum fuel oil; this was due to the lower viscosity of tar oil, which meant better pulverisation and quicker burning at the top of the card. In their experiments on the matter they obtained the highest overall thermal efficiency with alcohol. With regard to the choking of the pulverisers, their experience showed that it was only with the tar oils rich in naphthalene that the choking occurred. There were two crystalline bodies in tar oil, naphthalene and anthracene; the latter was in smaller quantities, and mainly present in the high boiling fractions. The effect of both was quite similar, and the two together were responsible for the solidification in tar oils. The disadvantages of using tar oil without pilot ignition were that one had nothing like so wide a choice of oils, and therefore could not depend so much on getting suitable supplies; also to get reasonably good working, it was absolutely essential to have increased compression. With the pilot ignition, one could work with 480 lb. compression, but without it he thought that not less than 600 lb. would be required. It was also usual when running on tar oil without pilot ignition to use hotter circulating water, and this, of course, increased the liability to deposits in the water jackets.

Mr. G. Nevill Huntly said that the water content was frequently distributed very irregularly in the fuel oil, and the sampling difficulty must be met by taking a large sample for this determination. The gross calorific value should always be asked for, and the necessary calculations for the net figure made by the engineer. The gross value was a definite experimental figure, but there were several "net" values in use, based on different definitions. The percentage insoluble in xylol was simply a measure of the suspended matter in the tar oil, and a high percentage of suspended matter was regarded as likely to cause trouble in the pulverisers, as it might form nuclei for the deposition of carbonised material. There seemed no reason from the chemical point of view why naphthalene should cause trouble in the pulverisers. It melted at about 80 deg. C., and would be in solution in the oil at temperatures below this.

Mr. E. A. Evans agreed that it would be unwise to formulate a rigid specification for tar oil at present. Our knowledge of tar oil as a fuel was far too meagre to make more than very elastic suggestions to guide would-be purchasers of tar oil. Specific gravity should be determined with the aid of a specific-gravity bottle in preference to a hydrometer. Prior to the determination of free carbon the oil should be filtered through fine lawn to remove pieces of wood, &c. The simplest method of testing for free carbon was to examine the oil under a microscope. If the carbon were in a colloidal state it would not give any trouble, but if it were flocculated, or coarse, trouble must be expected. Coke residue was purely an arbitrary figure obtained by a method which had not even been standardised, hence different experimenters were liable to report different results. Consequently, it was advisable to specify the *modus operandi* when submitting a sample of tar oil to a chemist. He agreed that the gross calorific value should be stated. Suppliers would always give the higher value. The differences between the hydrogen content of various tar oils were not great; therefore, it mattered little whether the "gross" or the "net" value was adopted. It was most desirable to keep the ash as low as possible, because any unburnt substances might choke valves, act as abrasives on moving parts, and exert a deleterious action upon the lubricating oil. As tar oil did not usually contain more than 1 or 2 per cent. of sulphur they need not be anxious about this factor. The action of sulphur upon the lubricant was always overlooked, but it should not be. The efficiency of tar oil as a fuel was largely dependent upon the mode of feed, &c. Much trouble was encountered by choking pulverisers. This did not appear to be due to impurities in the fuel, but to chemical action.

Mr. P. H. Smith remarked that as a result of service trials of over 40 different tar oils which were subsequently analysed, he was inclined to characterise the constituents of tar oil insoluble in xylol, and ash, as undesirable. They should be as low as 0.1 per cent., as a quantity greatly in excess of this appeared to be associated with piston seizures in the larger engines. An oil rich in coking residue generally contained a high proportion of naphthalene. One or both of these elements made for safety, that is to say, allowed of the engine being run at smaller loads than would otherwise be possible without danger. An oil containing coking residue amounting to about 5 per cent. appeared to give best results in service. The difficulties experienced through naphthalene crystals might be satisfactorily overcome by adopting one of several proposals, one of which was an addition of crude oil. In the coldest weather of the past winter a mixture of 25 per cent. crude oil with 75 per cent. tar oil had not, apparently, been attended with the phenomenon of crystallisation, so apparently the proportion of crude could be further reduced. With blended oils the engine operated with greater reliability than on straight tar oil, provided that the tar oil content was judiciously selected. The minimum safe load with engines to which no special adjustments had been made ranged round about 0.8 of full rated load. An English invention, not yet fully developed, apparently was "safe" throughout the full range of load of the engine. Two special adjustments appeared to have been adopted to burn tar oil in Diesel engines, whatever system was adopted. The timing of the opening of the fuel valve had been advanced from 2 deg. to 3 deg., and a slightly smaller flame plate had been fitted. This combination gave a rather peaky card, which had already come to be generally recognised as the most satisfactory for engines working on tar oil. A year or so ago it was generally thought that high compression and high cooling water temperature greatly assisted in burning tar oil without special apparatus. Engines which were working with fair satisfaction under these conditions gave better results with a normal compression of 33 metric atmospheres and an outlet temperature of the cooling water about 100 deg. F. as against 160 deg. F. One such engine was now generating 94 to 95 per cent. of its output on tar oil, and the fuel consumption was barely 6 per cent. greater than on crude. Sleeve pulverisers had been in operation some considerable time, and he had not yet had it reported to him that any had choked.

Mr. C. T. Westlake said that at Guernsey they were troubled with the pulveriser cones and ring choking, and had used sleeve pulverisers to overcome this. These also helped in running on low loads. Their engines ran without pilot ignition, and used a compression of 480 lb.; the cooling water was kept between 100 deg. and 120 deg., as they found no advantage in running at a higher temperature. The chief disadvantage of working without pilot ignition was in not being able to run at low loads. Where engines had to run at low loads it would be quite satisfactory to run with one cylinder cut out. The remaining cylinders would be working more efficiently. He did not believe in stirring the oil to overcome crystallisation. The oil contained impurities which were best left to settle out at the bottom of the tank.

Mr. George B. Vickers said that Messrs. Hick, Hargreaves and Co. had put down a large three-cylinder engine purely for experimental use. Experiments were being carried out, and he had every reason to hope that tar oil would be successfully used right down to light load without the assistance of pilot ignition. Until reliable data had been obtained those users who were compelled to change over to tar oil, and who had to run frequently below, say, half-load, were well advised in using pilot ignition. They should aim at simplifying the Diesel engine, and if adjustment for tar oil could be made by a re-designed pulveriser and flame plate which would equally suit tar oil or petroleum oil, he thought that this was the right line of action, rather than an uncontrolled pilot pump, which certainly did not simplify the engine.

Mr. W. A. Turnbull said that mixing tar oil and crude oil, in his experience, had been most unsatisfactory. He had now been running on tar oil since August, 1916, with perfect satisfaction, without pilot ignition. At first the pulverisers blocked up, requiring a high blast, but now every five hours they run for 15 minutes on crude oil or paraffin, and the engine ran 300 hours without cleaning the pulverisers; even then it was really not necessary to clean them. From September, 1916, to May, 1917, the Diesel engine plant at Aylesbury generated 369,346 units, with a consumption of 75,248 lb. of crude oil (residual petroleum oil) and 194,000 lb. of tar oil. This corresponded to an average of .73 lb. of fuel oil per unit, as against an average of .69 lb. of fuel oil per unit when crude oil alone was used. On particular tests he obtained a result of .65 lb. of crude oil per unit, and .735 lb. of tar oil per unit. In both these cases the test was carried out at full load.

Mr. Napier Prentice, in a communication, said that without pilot ignition the consumption of residual petroleum at Felixstowe was only 10 per cent. of the fuel used, and, therefore, compared equally well with pilot jet ignition. Their tar oil had been practically free from naphthalene, and yet they found it advisable to clean the pulverisers after 50 hours' running. With a comparatively poor load factor and small output, they had saved £390 to the end of May by the use of tar oil, and this with no capital outlay.

Mr. Percy Still, in a communication, said that the results of tests on samples of tar oil obtained from the same source varied very considerably, and to check some of these results it was decided to send precisely similar samples simultaneously to two laboratories to be tested. Both of these laboratories had had considerable experience in carrying out tests on fuel oils. Particular care was exercised in taking the two samples at the same time and in the same manner from the same bulk of tar oil. These were placed in similar cans, which were then sealed and sent to be tested at the two laboratories. The comparison of the results obtained might be of interest:—

	Laboratory A.	Laboratory B.
Flash point	(Closed) 165° F.	(Open) 197° F.
Sulphur	0·95 %	2·12 %
Water	1·57 %	2·9 %
Coke	13·8 %	8·39 %
Solid matter insoluble in xylol	0·12 %	0·48 %
Ash	0·19 %	0·02 %
Acidity	Nil	Trace
Percentage by weight distilling below 300° C....	57·5 %	73·10 %
Specific gravity at 60° F. ...	1·057	1·053
Viscosity, Redwood No. 1, at 60° F.	76 sec.	70 sec.
Calorific value, B.Th.U. per lb.	17,030	16,532

Mr. Geoffrey Porter (President) replied in detail to the points raised in the discussion. Incidentally, he drew attention to the enormous discrepancies between the chemical analyses quoted by Mr. Still.

BUSINESS NOTES.

Useful Compositions.—A cement that sets like stone, and can withstand a temperature of 1,100° C., has obvious uses in engineering. These qualities are claimed for "Permanite," an adhesive cement made by the National Chemical Works, Ltd., Stanley Road, South Acton, London, W., which sticks to anything, and resists the action of oil, acid, petrol, &c. It is useful for making oil-tight joints, fixing articles in metal sockets, attaching canvas, &c., to metal, and a variety of other purposes.

A somewhat similar composition made by the same company is "Pulleystone," a "pink paste put on pulleys," which sets hard, and is claimed to double the adhesion of the belts. It is not a belt dressing; it is applied once only, and forms a new and permanent surface, which grips the belt, without wearing it as much as the usual iron surface does. The belt can be run slacker, diminishing the friction loss, and at shorter centres, thus saving space.

Openings in Italian Markets.—List No. 33 issued by the British Chamber of Commerce for Italy (Inc.), Genoa, includes the following inquiries from Italian firms, many of whom formerly did business with German and Austrian houses:—

No. 1,322.—Florence firm would buy for own account (or represent on commission):—Electrical material and lamps, ironmongery, hardware, copper sheets and bars, &c.; F.G.F.

No. 1,401.—Italian firm at Bari wish to represent manufacturers of motors, machinery, and tools, for agricultural, electrical, and building purposes; B.C. & T.

No. 1,404.—Genoa engineers would represent firms manufacturing or exporting: Electrical material, chemicals, also steel, tools, and general machinery and engineering articles; G.P.C.

No. 1,406.—Engineer, manager of a mining company, would represent British manufacturers of industrial machinery in general, especially for shipbuilding; I.A.G.

No. 1,412.—Rome firm would represent on commission or buy for own account:—Electrical articles, lamps, insulators, lampholders, switches, &c.; R.G.B.

No. 1,414.—Party at Venice would represent on commission manufacturers and exporters of:—Machinery, tools, aircraft motors, engineering articles, &c.; V.A.M.

No. 1,415.—Genoa representatives would handle on commission:—Gas and electric stoves and fittings, &c.; G.A.G.

No. 1,419.—Commission agent at Genoa is open to handle:—Metals, belting, engineering supplies; G.L.F.

Dissolutions and Liquidations.—Vaughan Engineering Works, Ltd., 22, Cross Street, Islington, London.—Winding-up order made July 24th.

Leitner Electrical Co., Ltd., Woking.—August 23rd is the last day for the receipt of proofs for dividend by Mr. G. E. Corfield, the liquidator.

Universal Cable Code (Parent) Co., Ltd., London.—Liquidator (Mr. H. de V. Brougham) released July 25th.

Therol Foreign Patents Syndicate, Ltd.—A meeting is to be held at Bank Chambers, High Holborn, on September 5th, to hear an account of the winding-up from the liquidator, Mr. H. M. Bayly.

Robinson Shields Co., dealers in electrical goods and appliances, Kingsway Hall, Kingsway, W.C.—Messrs. W. Y. Robinson and A. J. Shields have dissolved partnership. Mr. Shields will continue the business under the old style, and will attend to debts, &c.

Bankruptcy Proceedings.—Ralph Robinson Greenwell (otherwise Gordon Granville), a director of the Harvey Electro-Chemical Co., Ltd.—An application was made to Mr. Registrar Mellor at the London Bankruptcy Court on Friday, July 27th, for an order of discharge. The Official Receiver reported that the bankrupt failed in September, 1914, with ranking liabilities £5,020, and assets valued at £203, but which had produced only £31 11s. 4d. In 1912, with money borrowed and still owing, the bankrupt subscribed for £500 shares in the Harvey Electro-Chemical Co., Ltd.; in February, 1913, he became a director of that company, but in February, 1914, a Receiver was appointed. He attributed his insolvency to the depreciation in the value of his shares, to the stoppage of his business owing to the outbreak of the European war, and to a judgment obtained against him by Mrs. Gordon, the petitioning creditor, for £750 paid to him to be expended in the purchase of fully-paid shares in the Harvey Electro-Chemical Co., Ltd. As offences against the Act the Official Receiver reported (1) insufficiency of assets to equal 10s. in the £ on the amount of the unsecured liabilities; (2) omission to keep proper books of accounts; (3) contributing to the bankruptcy by rash and hazardous speculations; and (4) misconduct in having failed to apply to the purpose for which he received it, £750 handed him by the petitioning creditor for the purchase at par of fully-paid preference shares in the Harvey Electro-Chemical Co., Ltd.; also misconduct in failing to attend for the public examination, and to obey an order of the Court in relation to his statement of affairs. The learned Registrar said the serious part of the case was the misconduct of the bankrupt. He received £750 from Mrs. Gordon for the express purpose of purchasing fully-paid preference shares in an electric company; he appeared to have spent £400 in the purchase of fully-paid ordinary shares, and with the balance he purchased preference shares that were only partly paid; he had never handed over to the lady any fully-paid shares, and the result seemed to be either that he had put this money in his pocket, or else he had spent £400 of it according to her instructions, and having acted upon it he had never handed her the shares. Later, being hopelessly insolvent, he had offered her shares which were not fully paid. He defended the action brought by the lady for recovery of the money, but judgment was given against him, and these bankruptcy proceedings ensued. He was also guilty of misconduct, in that he had absented himself from the Court from February, 1915, until a warrant was issued against him in May, 1917. All the offences reported by the Official Receiver had been established, and the discharge must be suspended for three years. Order entered accordingly.

Catalogues and Lists.—Messrs. Pass & Seymour, Inc. (U.S.A.).—Circular tabulating particulars of Dim-a-lite adaptor lampholders, together with a copy of a report of examination made for the Benjamin Electric, Ltd., by the National Physical Laboratory.

Mr. George Ellison, Wellhead Lane, Perry Barr, Birmingham.—List No. 431, dealing with cable fittings, &c., for attachment to ironclad switchgear of the industrial type, with prices, dimensions, and weights. A novel feature of "Ellison" cable adaptors and fittings is a patented cone clamp for the armouring, which can be easily cut on site to suit any ordinary cable. No special drilling on site is required, and the cone clamp affords efficient means of bonding the armouring or other cable covering to the switchgear case for earthing purposes.

Messrs. Rose Bros., 25-27, Milton Street, London, E.C.—Priced leaflet describing the R.B. "Adamant" electric pipe lighter.

Book Notices.—*Hints on Rectifying Faults in Motor Control Gear.*—Mr. George Ellison, of Birmingham, has sent us a copy of the pamphlet above named, which has been published with the view of assisting electricians in charge of electrical plant, as well as purchasers of protective switchgear. It is one of those excellent manufacturers' specialist publications which, as we have often pointed out, are packed full of practical wisdom and knowledge based upon prolonged experience, dealing with a subject far more fully than any text-book can, and designed expressly to furnish the maximum amount of information to the reader who uses the apparatus of which it treats. Starting at the very beginning—the wording of the order for switchgear—the author shows how numerous are the opportunities for error or omission in describing the requirements of the purchaser; he then passes on to the consideration of the working conditions of starters and controllers, the different methods available for starting motors, causes of failure, the care of switchgear, pressure rises, oil tanks, inching, braking, &c. A few pages of illustrations of the publisher's own well-known and justly esteemed controlling gear are appended. The booklet will be of great value to many besides those for whom it is written.

Preliminary Mathematics. By Prof. F. E. Austin. London: E. & F. N. Spon, Ltd. Price $1·20.—This book is intended to form a connecting link between the study of arithmetic and the study of algebra, and should be used as an auxiliary, in conjunction with other text-books; its chief object is to show how to solve problems, and how to apply theory to practice. Hence it consists very largely of worked examples, and problems to be solved by the reader. The author has a very lucid style, and leads the student on by gentle steps from the most elementary ideas up to the use of logarithms, the solution of equations of the first degree, quadratics, progressions, &c. Various actual examination papers are appended, with complete solutions to the problems.

"Production." Monthly report of the British Empire Producers' Organisation. London: Kingsway House.

"Correction Tables for Thermodynamic Efficiency." Calculated by C. H. Naylor. London: E. Arnold. Price 5s. net.

"Heat Drop Tables: Absolute Pressures." Calculated by H. Moss. London: E. Arnold. Price 5s. net.

"Practical Costing." By A. H. Gledhill. London: The Gledhill-Brook Time Recorders, Ltd. Price 3s., post free.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXXVI. No. 7. July, 1917. New York: The Institute. Price $1.

"The Predetermination of True Costs and Relatively True Selling Prices." By F. A. Parkhurst. London: Chapman & Hall. Price 5s. 6d. net.

"Directions for Designing, Making, and Operating High-pressure Transformers." Second edition. By Prof. F. E. Austin. London: E. & F. N. Spon, Ltd. Price 3s. net.

Holidays.—The works of Messrs. Rhodes Motors, Ltd., are to be closed from to-night (Friday) until Monday, August 13th, for the annual holidays.

The works and offices of the Hoffmann Manufacturing Co., Ltd., Chelmsford, will be closed from noon to-morrow (Saturday), until the morning of Monday, August 13th, but urgent correspondence and orders received between August 7th and 11th will be dealt with.

For Sale.—The London Electric Firm, Brighton Road, Croydon, are offering for disposal a Croydon factory (about 5,000 ft.) with shafting, motors, &c.

Cricket.—At Dagenham, on Saturday last, an interesting game was played between the Sterling and Marconi Lady Cricketers, the home XI winning by 60 and 86 to 39 and 34. The fielding of the visiting team was particularly smart. Mr. Guy Burney, the president of the club connected with the Sterling Works, in a happily expressed speech, gave the visitors a hearty welcome. Mrs. Guy Burney kindly entertained both elevens and friends to tea.

LIGHTING AND POWER NOTES.

Argentina.—The electric light company at Las Varillas (Province of Cordoba) has affixed posters throughout the town notifying that the service will be suspended as from July 1st owing to the accounts for the past four months not having been met.

Another company—the Compania de Eléctricidad de la Provincia de Buenos Aires—is experiencing difficulty in collecting the amounts due to it from several municipal authorities in the Province of Buenos Aires. The total of municipal debts to the company is $781,342.

The Compania Italo-Argentina de Eléctricidad has entered into an agreement for the supply of electricity to the Compania de Tramways Eléctricos del Sud.—*Review of the River Plate.*

Australia.—The Sydney City Council has accepted the offer of the Railway Commissioners to supply electricity up to a maximum of 4,000 KW. for a period of two years, the Council paying the Commissioners £6,000 per annum for the maximum load of 4,000 KW. and 0·3d. per KW.-hour for all power supplied; under this arrangement the payment will be dated from the day on which the converting plant and electrical equipment were completed.—*Tenders.*

Barrow-in-Furness.—The electrical engineer has been nominated a member of the Barrow Coal Supply Committee to interview the Coal Controller, with a view to obtaining coal from Lancashire instead of Northumberland and Durham, as proposed in the new scheme.

The Electricity Committee has agreed to contribute £2 2s. per annum to the work of the Research Committee on the heating of underground cables.

Bath.—Price Increase.—The Electricity Committee has decided to increase the present charges by ½d. per unit for lighting and 5 per cent. for heating.

Batley.—Year's Working.—The annual statement of accounts of the Corporation electricity department, just issued, shows a loss of £186 on the working of the year ended March 31st. These accounts show the first full year's working of the three-phase E.H.T. alternating-current installation, including a turbo-generator of 1,200 KW., two rotary converters, switchboard, and water-tube boiler, which, with extensions of mains and sub-stations, involved an additional capital outlay of between £15,000 and £16,000, and gave rise to expectations of so lowering the costs of production that better profits would be made. These expectations have failed to materialise owing to the increased cost of coal and reduced consumpton of current, owing to the war, and the result is a loss of £186, as compared with a profit of £173 in the previous year. Mr. S. Derwen Jones, the borough electrical engineer, in his report, shows that great economy has really been affected by the working of the new plant, and he shows a reduction in working costs (apart from interest and sinking fund) from 1·08d. to 0·975d. per unit. The war, he states, prevented the completion of the cable extensions, and thus some firms who intended to take an alternating supply have been unable to do so; some of the night load also has fallen off owing to the shortage of workpeople in the industries. The fact that the bulk of the present supply is continuous current, necessitating conversion from the alternating current supply, involved a loss during the year of about 11 per cent.—a loss which must be proportionately smaller to the total load as the alternating current load increases. Owing to restricted lighting and the Summer Time Act, the lighting supply fell off 7½ per cent. The traction load increased slightly by 3,594 units, whilst the power load increased by 282,113 units, or 37·5 per cent., maintaining the steady increase of the past five years. Mr. Jones advocates that, as the lighting load has tended to become more and more a purely winter load, any contemplated increase in the price of current should be on the lighting only, and that the 7½ per cent. should be raised to 12½ per cent. The consumption of coal has been reduced, and the coal per unit generated has been brought down from 5·7 to 4·04 lb. The cost of coal on the year, including carting, tipping, &c., had been reduced from 0·54d. to 0·455d. per unit sold.

Birmingham.—Price Increase.—The Electric Supply Committee recommends that the new scale of charges, which increases the existing charges by approximately 15 per cent., should take effect as from the Michaelmas reading of the meters.

Bournemouth.—Price Increase.—The Bournemouth and Poole Electricity Supply Co., Ltd., has advanced the price of current, from the date of the Michaelmas quarterly meter readings, by a further 5 per cent., making an increase during the war of 20 per cent.

Bradford.—Price Revision.—The Electricity Committee is recommending the Corporation to increase the charges for current as follows:—Power consumers having maximum demands of under 5 KW., and power consumers on the restricted hour rate, to pay an additional 20 per cent. The accounts of all other consumers which are not subject to adjustment in accordance with the price of coal (with the exception of the tramways department and consumers charged on the 4d. flat rate) to be increased by 10 per cent. For heating and cooking, current to be supplied at a flat rate of ½d. per unit, plus 10 per cent. to consumers already taking supplies for other purposes at the premises concerned.

Bristol.—Fringe Order.—Negotiations have been concluded for supplying the Hanham Colliery at a point beyond the supply area, and the B. of T. is to be asked to grant an Order under the E.L. Act, 1909, to enable this arrangement to be completed.

Croydon.—Price Increase.—In view of a loss of £3,100 (which will be reduced to about £1,100 by retrospective repayments) on the last year's working of the electricity undertaking, and an estimated loss of £4,210 during the present year, it has been decided to increase the charges for electricity by 15 per cent., in addition to the 10 per cent. approved in May, 1916. This will still leave an estimated deficiency of £1,200 at the end of the present year.

Deal and Walmer.—The D. & W. Gas and Electricity Act has been extended for a year.

Derby.—Proposed Loan.—The T.C. has approved a scheme for the supply of electrical energy to additional works proposed to be erected for chemical manufacturing. It has also decided to make application to the L.G.B. for sanction to the borrowing of £90,000, the estimated cost of the new electrical plant necessary.

Edinburgh.—Proposed Price Increase.—The Electric Lighting Committee recommends that an increase should be made in the charge for private lighting from 3½d. to 3¾d. per unit, and that the charge for power should be increased from the present rate of 1¼d. plus 5 per cent. to 1¼d. plus 10 per cent. This charge does not affect special agreements. The charges, if adopted, will take effect as from May 15th last. The estimated expenditure of the department for the year 1917-18 is £102,820, and the revenue is £156,290 on the old rates, but if the proposed increases are adopted, an additional sum of £3,000 is calculated upon.

A deputation was received by the Corporation Electric Lighting Committee from the East of Scotland Cinematograph Exhibitors' Association, who complained of the charge made for inspection of their electrical installations. These inspections are ordered by the magistrates, and the electricity department holds that, as it is an ordinary trading concern, it does not fall within its duties to provide inspectors for this public purpose except on reasonable charges. The Committee is to have a meeting with the magistrates regarding the matter.

Heston and Isleworth.—Year's Working.—The report of the electrical engineer on the working of the U.D.C. electricity undertaking for the year ending March last—the 12th year of the concern—shows that the total income was £12,015, an increase of £768 over the previous year. The total working expenses were £7,100, an increase of only £68, leaving a gross profit of £4,914. After providing for interest and loan charges, amounting to £4,922, there was a net deficit of £7. There was an increase in units supplied for power of 29,490, and of those for private lighting of 15,180. On the other hand, the units for public lighting have decreased by 116,219, which gave a net decrease in units sold of 71,549. Dealing with the output, he shows that 1,608,588 units were generated, an increase of 44,115, and the number sold was 1,216,822, of which 890,980 were for power. The average price per unit showed a gain of ·35d. per unit. The works costs had risen from 1·23d. per unit sold to 1·33d.

High Wycombe.—Street Lighting Charges.—The T.C. has decided to lodge an appeal in connection with the recent action for £1,290 successfully brought against the Corporation by the Electricity Co. in regard to street lighting. The Judge considered that he was bound by the decision in the case—Leiston Gas Co. *v.* the Leiston R.D.C.

Ilford.—The Electricity Committee of the Council has instructed its electrical engineer to communicate with the Coal Controller with regard to the utilisation of steam from the destructor. After negotiations the Coal Controller agreed to request the Ministry of Munitions to grant the necessary priority certificate to carry out a temporary steam scheme to make use of the steam now being wasted. It is proposed to transfer a 200-KW. set from Ley Street, and run cable from the destructor to Meads Lane, at a total cost of about £600. At a joint meeting of the Electricity and Lighting and Tramways Committees, the charge for electric current to the tramways for the year ended March 31st, 1917, was fixed at 1¼d. net per unit. The Director of Electric Power Supply at the Ministry of Munitions has notified that he is prepared to approve a scheme of extension to certain works. The L.G.B., upon being referred to, requested that when tenders for converters and cable had been obtained, the Board be furnished with a detailed estimate of the cost.

Kingston-upon-Hull.—The extension order has been further extended by a year.

Leek.—Suggested Linking-up.—The U.D.C. has received a communication from Stoke-on-Trent Corporation suggesting that the respective electricity committees should meet, with a view to discussing the possibility of supplying electrical energy or the preparation by the respective electrical engineers of a scheme for linking-up the two systems. The Council decided to agree to the suggestion.

London.—L.C.C.—The Finance Committee recommends the sanction of the Council to the borrowing of £1,441 by the Battersea B.C. for the extension of electricity mains; £3,746 by the Bermondsey B.C. for a new electricity main; £1,000 by the Bethnal Green B.C. for house connections; and £3,500 by the Hackney B.C., for mains, tranformers, &c.

L.C.C. Theatre Inspections.—The Theatre and Music Halls Committee reports that recent inspections of the electrical and mechanical installations at places of public entertainment show a marked falling off in the standard of maintenance and repair, due partly to the difficulty of getting repairs executed and partly to the employment of unskilled men. Owing to the depletion of the Fire Brigade staff, the Committee in 1915 approved of a reduction in the frequency of inspection; but the Committee is now of opinion that in the interests of public safety more frequent inspections are necessary.

L.C.C. and Electric Supply Developments.—The L.C.C., in a letter to Borough Councils owning electricity undertakings, refers to the conference, two years ago, between its Special Committee on London Electricity and representatives of London Councils and London companies, upon the question of electricity supply in London, and states that recent events have given rise to a situation which renders it desirable that a further conference should be held at an early date.

Islington.—The Electric Lighting Committee recommends that application be made to the L.C.C. for sanction to the borrowing of £53,000 for various extensions to the electricity undertaking. The Government authorities concerned are prepared to support the application.

Southwark.—The electrical engineer reports that the working of the "Summer Time" Act has made a serious reduction in the output, the lighting demand being practically non-existent after the power load goes off in the evening. The falling off in the consumption of electricity, together with the increase in wages and the continued rise in the cost of materials, makes a further increase in the lighting rate unavoidable. The Committee decided that the following rates shall come into operation from September 30th, 1917:—Lighting, 6d. per unit for the first 1,200 units per quarter; 5d. for the second 1,200 units; 4d. for the third 1,200 units; 3d. for all over 3,600 units. Two-rate (combined lighting and power), 8d. per unit during "restricted" hours; 2d. during "unrestricted" hours.

Meltham.—Proposed E.L.—The U.D.C. has under consideration the proposal of the Huddersfield Corporation to apply for a Provisional Order to supply electricity to the Meltham area. The Corporation is to be asked to receive a small deputation from the Council to discuss the matter further.

Plymouth.—The Corporation has decided to apply to the B. of T. for sanction under Regulation B 1 to disconnect classes of non-essential consumers in cases of urgent necessity, in order to enable the supply to be continued to essential users.

Stockton-on-Tees. — Year's Working. — The total revenue of the electricity department for the year ended March 31st, 1917, was £10,351; expenses amounted to £6,084; and, after meeting financial charges, there was a net loss of £1,438. A total of 1,717,923 units was sold, while 566,260 units were generated and 1,271,827 units were purchased on bulk supply terms (·55d. per unit).

Sutton.—In reference to our note of last week in regard to the enforcing of the minimum charge of 13s. 4d. per quarter, on the present occasion the six summer months are to be regarded as one quarter for this purpose.

Todmorden.—Wages.—The Corporation employés application for increased wages is to be referred to arbitration, the men having refused the Council's offer.

U.S.A.—The Senate and House of Representatives have agreed to the conference report on the Bill permitting the present maximum diversion of 20,000 cb. ft. of water on the American side of Niagara Falls. The measure carries an appropriation of $25,000 for an investigation by the War Department. But for the legislation just enacted, 50,000 H.P. would have been cut off on the American side of the Falls.—*Electrical World.*

West Bromwich.—The T.C., last week, decided to spend £2,300 in extensions to plant at the electricity works, which, it was stated, would enable the department to practically double the output. Last year there was a net loss of £4,696, largely due to the fact that the department was under contract to supply several large consumers at pre-war rates. An agreement has now been arrived at, however, whereby these consumers will help the department to meet the deficit.

York.—Prov. Order.—The B. of T. has extended the period for one year for carrying out the York Electric Lighting (Extension) Order, 1914.

Year's Working.—The annual accounts of the Corporation electricity department for the past year show a total revenue of £41,737, and expenditure amounting to £24,062, leaving a gross profit of £17,676. After providing for interest, sinking fund, &c., the net profit amounts to £1,941.

TRAMWAY AND RAILWAY NOTES.

Barking.—The lease of the section of the tramways between the Broadway and the Boundary Bridge to the East Ham Council has been renewed by the U.D.C. for three years, at an annual rental of £450.

Blackpool.—The receipts on the Corporation tramways during the past month show an increase £1,328 on last year. From April 1st to July 19th the receipts were £29,707, an increase of £2,773 on 1916. The Corporation has now taken over the line between South Shore station and the borough boundary at Squire's Gate, formerly leased to the Blackpool, St. Anne's, and Lytham Tramway Co., but the latter retains running powers.

Chester.—The gross profit on the tramways undertaking for the past year amounted to £5,820, as compared with £5,244 for the previous year.

Continental.—Swiss Railway Electrification.—The electrification of the Swiss Federal railways, which has been advocated for 15 years, is now occupying the serious consideration of the Government, which has created a special department attached to the Direction of the Swiss Federal railways to consider offers of material and equipment for the work. The question of electrification has become acute during the progress of the war, with the serious shortage of coal; the coal imports for the first three quarters of 1916 represented only about half the quantity imported in the immediate preceding years, while the cost was considerably increased. The Federal Railways form the main portion of the Swiss Railway system, and their electrification is simplified by the great store of undeveloped water-power. The time necessary for carrying electrical improvements into effect will depend upon varying conditions, such as the duration of the war, the condition of the money market, and the development of the needs of Swiss industries and transportation companies. The average demand will amount to about 220,000 H.P., and the maximum load to 550,000 H.P.

The total Swiss railway system, Federal and other, amounts to 3,216 miles, of which 1,700 miles are Federal and 1,516 miles are owned by corporations. Of the private lines, 622 miles are already electrified, but only about 50 miles narrow and other gauge of the Federal railways are operated by electricity. Looking to further electrification, the Federal railways have already acquired numerous water properties in the valleys of the Reuss, Leventina, Rhone, and in the Trient, Canton Valais, and elsewhere. In all, 10 hydro-electric plants are projected, with 500,000 H.P. capacity. Two of these, the Amsteg and Ritom works, supply the Gothard Railway from Lucerne to Chiasso.

The first important Federal standard gauge line to be electrified is the Erstfeld-Bellinzona branch of the Gothard Railway on the Lucerne-Chiasso-Milan line. This line was acquired by the Swiss Federal Railways in 1909, and is 68 miles in length, with 28 per cent. of tunnels and a grade of 2·5 to 2·7 per cent. for 25 miles; it was selected for experiment because of its enormous traffic with Italy, which caused a heavy consumption of coal with resulting smoke in the tunnels. The electrification is expected to be finished in three to five years; the line is being constructed on the same system as that of the private company, Berne-Loetschberg-Simplon. In 1911 the Erstfeld-Bellinzona line had a traffic requiring 19,000 H.P. a day; experts foresee a certain increase to 21,000 H.P., and a probable increase to 26,000 H.P.; therefore, in order to meet all emergencies, a limit of 60,000 H.P. is being planned for.

The Commission has decided to install five turbines of 8,000 H.P. instead of three turbines of 13,000 H.P. each. The works at Amsteg develop 26,000 H.P. and at Ritom 32,000 H.P. from the Ritom Lake; for this construction 1,600 yards of pipe line is necessary. Another series of plants developing 70,000 H.P. is contemplated for Eastern and Central Switzerland. The cost of electrification of the Erstfeld-Bellinzona line is estimated at £1,600,000, and the cost of electrifying the entire Federal Railway system is estimated, roughly, at £40,000,000.—*U.S. Commerce Reports.*

Halifax.—Wages. — The Corporation has agreed to submit to arbitration a demand by the employés for an advance of 12s. per week above pre-war wages. The Corporation granted 8s. per week, which the men do not consider sufficient.

Keighley.—Wages Award.—The award of the arbitrator in the tramway workers' application for higher pay, is that there be no alteration in the minimum rates, but that males of 21 and upwards should have war bonus increased from 5s. to 6s. per week, and those under 21 shall have bonus of 3s. per week. Female employés of 18 years and upwards are to have 3s. 6d. bonus, and those under that age 2s. These rates will operate as from the first pay day after June 30th.

Leeds.—Women Inspectors.—In regard to the proposed appointment of women inspectors, the Tramways Committee, after hearing the views of a deputation of workers, unanimously passed the following resolution for submission to the Tramway Workers' Union:—"That the Committee, having carefully considered the matter, resolve that the Union be informed that there is no intention that the females to be appointed shall have any control over the motormen; that the male inspectors shall continue to act as heretofore; and that the Committee, being quite convinced of the necessity of some increase of inspection and supervision, both in the interests of the public and of the female employés, do not consider there is any reason to vary their resolution of June 18th." This means that the Committee will proceed, subject to the City Council's approval, with the appointment of six female inspectors, who will be selected from amongst the women who were the first conductresses. Their duties will be confined to the inspection of tickets and supervision of the conductors, who are almost all females.

Leicester.—Fare Revision.—To meet an anticipated increased expenditure of £22,000 on the tramways during the present year as compared with 1916, the fares are to be revised and all free passes are to be withdrawn, except to blind and crippled persons and wounded soldiers. A site for a building for converting plant has been purchased on the north side of East Park Road, for £200. The estimated cost of the building is £1,580.

London. — L.C.C. — The Highways Department has settled 685 claims against the Council in respect of accidents arising in connection with the working of the tramways, at a cost of about £6,795. In 20 other cases actions were brought against the Council; in 12 of these a verdict against the Council was given, and sums amounting to £603 and costs had to be paid; six actions resulted in the Council's favour, and two were withdrawn. The Committee has approved the settlement for £461 of claims made by the Council in respect of damage to tramways property, and has also received £3,272 from H.M. Government in respect of the repair of damage to tramways property.

The L.C.C. Highways Committee recommends that its chairman and vice-chairman, or in the absence of either, Mr. W. J. Squires, attend the business meeting of the Municipal Tramways Association at Blackpool on September 20th and 21st, which will replace the usual annual conference.

Wolverhampton.—Year's Working.—The gross profit on the tramways for the year ending March 31st, 1917, was £26,180; deducting interest and repayment of loans, the net profit was £12,541, from which £6,580 is to be appropriated in aid of the rates. Owing to the impossibility of obtaining labour and material, a good deal of maintenance and repair work is in arrear. There is now £10,660 in hand to meet the cost of this suspended work. During the year 1,162,269 car-miles were worked and 14,913,789 passengers carried, as against 13,296,146 passengers in 1915-16. The sum of £56,645 stands to the credit of the reserve and renewals fund.

York.—Year's Working.—The annual report of the Corporation tramways for the year ended March 31st last shows total receipts amounting to £40,197; expenditure, £30,938; and a gross profit of £9,268. After providing interest on capital and contribution to sinking fund, &c., there was a deficit on the year's working of £964, as compared with a surplus of £1,792 for 1915-16. The car-mileage was 826,283 and the electric 'bus-mileage 76,993, while the car receipts were 10·9d. and the bus receipts 7·98d. per mile run.

TELEGRAPH AND TELEPHONE NOTES.

Argentina.—The Municipal Commissioners of Buenos Aires have received an application for a concession for an automatic telephone service in the city, from a Mr. Alex. Schwimmer, representing three strong financial houses, whose names and nationality are being kept secret. Mr. Schwimmer states that a capital of $25,000,000 m/n. will be available from this source whenever it is required.

A similar, but independent, application has been presented to the Municipal Commission by a company styled "La Positiva."—*Review of the River Plate.*

Brazil.—The Government proposes to erect a very powerful wireless station near the mouth of the Amazon. It will be in direct communication with the Sayville station, New York.

Round the World in 16½ Minutes.—The *New York Times* recently dispatched a telegram to itself round the world; the circuit, 28,613 miles in length, was traversed in 16½ minutes, the shortest time on record for an ordinary message.

Spain.—A draft scheme has been presented by the Director-General of Communications to the Government of a project to reform the national telephone system. Premising that Spain possesses only one telephone for every 571 of her town populations, while France has one for every 143, England one for every 63, Germany one for every 43, and Denmark one for every 23; and that Spain has one rural office for every 45,000 inhabitants, while Germany has one for every 1,500, Denmark one for every 1,350, France one for every 2,321, and England one for every 3,440 inhabitants, the draft scheme proposes to establish telephone offices in the greater number of town and rural communities hitherto unprovided with these services, which now only exist in 108 of the principal cities and towns. To carry out this project, it is proposed to impose on the provincial Deputations the obligation to contribute up to 20 per cent. of the cost of their respective networks, and call into being a National Telephone Institution with power to raise a fund of 60,000,000 pesetas, the estimated amount which the 40 provincial networks would cost, including the purchase of existing private rural lines. The fund created would be liquidated by the receipts from the telephone service. The scheme has, it is said, been well received in Spain.—*Industria é Invenciones.*

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Sydney.—August 22nd. N.S.W. Government Railways and Tramways. Thirty-six induction motors (Specification No. 488). September 19th.—One 225-h.p. synchronous motor (Specification No. 489). Particulars from Electrical Engineer's Office, 61, Hunter Street, Sydney.

Melbourne.—October 10th. Department of the Navy. Pumping plant and equipment for the Commonwealth Naval Dockyard, Cockatoo Island, Sydney. Specifications from the Director of Navy Contracts, Melbourne.

Blackburn.—August 4th. Steam coal for 12 months for the Electricity Department. Mr. P. P. Wheelwright, Engineer and Manager.

Keighley.—August 3rd. 12,000 tons best slack and small slack coal for Electricity Department. Six-monthly and twelve-monthly period. Mr. H. Webber, Boro' Electrical Engineer.

London. — Bermondsey. — Sept. 7th. B.C. 500-kw. rotary converter. See "Official Notices" to-day.

H.M. Office of Works.—August 7th. Insulated lamps and lampholders. See "Official Notices" to-day.

Warrington.—August 14th. 7,500 tons of slack coal for the Electricity and Tramways Committee during six months from September 10th, 1917, and alternatively for part or whole of 15,000 tons of slack during 12 months. Mr. F. V. L. Mathias, Borough Electrical and Tramways Engineer, Howley, Warrington.

CLOSED.

Barrow.—T.C. Electricity Committee:—

Steam and feed pipes.—Aiton & Co., £115.
Ironwork for boiler foundations.—Stirling Boiler Co., £242.
Motor for chain-grate stoker (exclusive of starting gear).—Electromotors, Ltd., £59 18s.
Sub-station h.t. switchgear.—British Thomson-Houston Co., £942.
Boiler and economiser foundations.—J. Simmons, £319.
Brickwork setting.—Bradley & Lonsdale, £415.
Sub-station foundations.—J. Simmons, £57.
L.T. switchgear.—British Thomson-Houston Co., Ltd., £367.
Renewal of contract for Featherstone washed peas for 12 months at same price as last contract.—O. M. Huartson.

Bath.—T.C. Stoker and fan for boiler at the electricity works: Underfeed Stoker Co., Ltd., £491.

Derby.—T.C. Accepted tenders:—

Two miles of overhead wires for the tramways.—B.I. & Helsby Cables, Ltd., £290.
Coal for the electricity works.—Mr. D. McCarthy.

Gloucester.—The Electricity and Light Railway Committee has accepted the tender of the D.P. Battery Co. for a new battery at the electricity works, with glass cells, at a cost of £933, subject to a satisfactory price being obtained for the old lead cells.

Leicester.—T.C. Accepted tenders:—

Siemens Bros., Ltd.—1,000-kw. rotary converter, £3,100; switchgear, £410.
Glover & Co., Ltd.—Cables, £3,425.

Leyton.—U.D.C. Tudor Accumulator Co.: Maintenance of accumulators at the electricity works.

London.—L.C.C.—The Highways Committee has purchased 42,335 tons of coal and 25 tons of coke for use at the Greenwich generating station, at a cost of about £73,000, during the quarter ended June 30th, 1917.

Supply of tramway fittings, equipment, &c., 1917-18. Accepted tenders:—

Class T 14, items 3 and 4. Baking and air-drying insulating varnish.—Pinchin, Johnson & Co., Ltd.
Class T 15, items 1 and 2. Finishing insulating varnish.—Jensen and Nicholson, Ltd.
Transfer of two rotary converters from Greenwich generating station to Woolwich, £365.—Dick, Kerr & Co., Ltd.
100 driving-wheel axle forgings for tramcars, £387 10s.—W. Beardmore and Co., Ltd.
Vulcanised-bitumen cable, £755.—Callender's Cable & Construction Co., Ltd.

Stepney.—Electricity Committee. Accepted tenders:—

1,200 tons of Colcerton small nuts.—J. H. Beattie & Co., 27s. 6d. per ton.
2,000 tons of New Hucknall Deep 1¼-in. slack.—A. Blackman & Co., 28s. 3d. per ton.

Manchester.—Electricity Committee. Accepted tenders:

High and low-pressure steam and feed pipework.—Stewart & Lloyds, Ltd.

Stores for 12 months:—

Boiler tubes.—British Mannesmann Tube Co.
Carbon brushes.—Le Carbone, Ltd.; Morgan Crucible Co., Ltd.
Dynamo brushes.—Johnson, Clapham & Morris, Ltd.
Electric wires and cables.—Andrew & Co.; B.I. & Helsby Cables, Ltd.; St. Helens Cable & Rubber Co., Ltd.; C. Macintosh & Co., Ltd.
Special turbine oil.—C. C. Wakefield & Co. (six months).
Air-cooled transformers.—British Electric Transformer Co., Ltd.
Stoker links.—Babcock & Wilcox, Ltd. (three months).

Salford.—T.C. Accepted tenders:—

Mann's Patent Steam Cart & Wagon Co., Ltd.—Five-ton steam tipping wagon for the Electricity Department, £800.
Doulton & Co., Ltd.—Stoneware conduits, schedule of prices approximately £154.

Walthamstow.—U.D.C. Accepted tenders :—

Foster Construction Co., Ltd.—Extension to boiler house at the generating station, £775.
Fleming, Birkby & Goodall.—Line material for tramways overhead equipment.
Frederick Smith & Co.—Trolley wire for same.
London & Lancashire Fire & General Assurance Association, Ltd.—Insurance of the first Brush Ljungstrom set at an annual premium of £60, less 15 per cent., to cover breakdowns to the extent of £1,250.
W. T. Henley's Telegraph Works Co., Ltd.—Cables.
British Thomson-Houston Co., Ltd.—Switchgear.
British Electrical Transformer Co.—Transformer.

Waterford.—Corporation. Recommended tender : Messrs. Keating & Gaule, installation of an electrical system in the fire station.

Wolverhampton.—T.C. Accepted tenders :—

Drake's, Ltd.—Duplicate drag link conveyor at the electricity works, £350.
Staveley Coal & Iron Co., Ltd.—Cast-iron pipes, £750.
Brush Electrical Engineering Co.—Two 300-kw. transformers, £238 each.
Lea Recorder Co.—Two recorders for measuring steam consumption, £95 10s. each.

NOTES.

National Insurance Acts.—The Umpire has decided that contributions are payable in respect of :—

2,358 X. Gatemen employed in connection with insured trades, and engaged wholly or mainly by way of manual labour—*e.g.*, in such work as opening and shutting gates, taking in and handing out checks, operating a weighing machine, keeping the yard tidy, carrying messages.

This decision modifies decision B. 50 (*Board of Trade Journal* of June 6th, 1912), and subsequent decisions relating to gatemen in so far as they may conflict.

In pursuance of the Unemployment Insurance (Umpire) Regulations, 1912, notice of an application has been given for decision as to whether contributions are payable or not for the following :—

499 X. Workmen described as valvemen, hydraulic main men, tar main men, tar pit men, employed in connection with coke ovens.

Any representation may be made to the Registrar, Office of the Umpire, 47, Victoria Street, London, S.W., 1, on or before August 9th. A decision will be given on or after August 13th.

Russian Electricity Prices : Application for Increase.—The Russian League of Electric Stations for Public Use has applied to the Ministry of Trade and Industry with a request respecting an increase in the price of electricity. The League explains that the present valuation of electricity will lead to the stoppage of electric concerns, which would, of course, reflect disastrously on the supply of power to industries working for the national defence, and introduce considerable disorganisation into the life of many towns. The only issue from such a position appears to be the granting of a legal order increasing the tariffs for electrical energy. At the same time, the League proposes a strict limitation of the profits of electrical concerns on the following basis :—The net profit of private electrical concerns for public use to be limited to 8 per cent. Half of the profits over 8 to 10 per cent. to be made over to district institutions, and all profits over 10 per cent. to go to the Treasury. The increases in the tariff proposed by the League are as follows :—Tariffs of 5 copecks and under inclusive, to 200 per cent. ; over 5 c. and up to 10 c., 150 per cent. ; from 10 c. to 15 c., 125 per cent. ; from 15 c. to 20 c., 100 per cent. ; from 20 c. to 30 c., 75 per cent. ; and over 30 c., 50 per cent. At the same time, however, the tariffs shall in no case exceed 60 copecks per KW.-hour (1 copeck = ½d.). In view of the importance of the request, as it affects the interests of the whole population, a special conference has been called of the Electrical Current Committee to consider the question.

The L.C.C. and Munitions.—Reports recently presented to the Education Committee of the Council give a short statement of the work accomplished during the past two years. Very soon after the formation of the Ministry of Munitions, efforts were made to utilise the educational resources of the London Technical Institutes to the fullest extent on munitions. As the demand for training students did not tax the whole energies of the Council's organisation, it was decided to detail skilled staff from other branches of the service into certain institutions which could take up the manufacture of gauges, this line being urgently called for at the time by the Ministry of Munitions, and it has been possible to develop this work to a remarkable degree by the utilisation of these skilled workers, with comparatively little interference with the normal activities in technical education. With the special object of avoiding interference with ordinary educational work, the training centres for munitions students were placed at Brixton and Shoreditch, where engineering instruction is not ordinarily given, and these centres were equipped with machines drawn from handicraft centres, and with more modern tools supplied by the Ministry of Munitions.

During the past eight months efforts have been concentrated on obtaining the most suitable and up-to-date machinery, and, as a result, the equipment of the centres has been brought up to a really high level. An effort has been made to secure such equipment as will not only meet the immediate urgent demand for the output of munitions, but will be of real value afterwards in technical training. It is now very clear that much more attention must be devoted after the war to instruction in workshop processes and production, and skilled staff suitably qualified will be necessary for this purpose. Fortunately, the line of work which has been successfully developed—gauge-making, &c.—has placed not only an adequate, but a more than adequate, staff within reach in the Council's service to enable each centre marked out for engineering training to be made a focus of educational activity far beyond anything previously possible.

The value of the machines and equipment provided is approximately £7,000. It is claimed that, jointly, the manufacturing centres are comparable in machine tool equipment with any technical college in the kingdom, so that, given adequate staffing, very great progress in machine shop training will be possible.

The total staff now engaged in these shops on the manufacture of munitions is 205. The output of gauges during the first year's work was 18,091 ; during the second year's work, up to June 30th, 1917, the output was 30,469 ; a total of 48,560 in two years. In addition, a quantity of work of less importance has been undertaken. The staff, as a whole, have been working from 64 to 74 hours per week for the past year, and the work done reflects the highest credit on those who have participated.

During the two years ended June 30th, 1917, 8,089 students have been under training as munition workers in the various centres, of whom 6,088 have been certificated on satisfactorily completing their training ; 5,751 of these are known to have obtained employment on work of national importance. The total staff engaged on training numbers 95.

Legal.—In the City of London Court, on July 31st, before His Honour Judge Rentoul, K.C., an action was brought by Mrs. Annie Jeffery, of Henley, to recover £1 10s. against Messrs. William Lund & Sons, jewellers, 56, Cornhill, E.C., for damage caused to a musquash seal coat through the defendants' electric heater not being sufficiently guarded. Plaintiff said that she went to the defendants' shop to buy a tortoise-shell bag frame, and was asked to look at one in the window. While she was doing that, her coat was burned by the electric heater, which was on the floor underneath the window. The burned piece of fur had been replaced at an expense of 30s. She bought the coat for £35, and while there had been a great difficulty in matching the fur, a casual observer would not detect the repair. Defendants said that the plaintiff's statement was quite accurate. She must have been short-sighted, and tip-toed to look into the window. Before he could say, "Don't go too near the radiator," she burnt her coat. Of course, they were sorry, but they could not accept the onus for the damage done. The radiator was wired in a proper manner. Judge Rentoul, K.C., was afraid it was not, or the plaintiff's coat would not have been burned. As the defendants invited people to go into their shop to buy goods, they must keep it in a safe condition, so that there would not be anything in the nature of what lawyers called a trap. There must not be anything that would burn a lady customer's coat. If the plaintiff was short-sighted—and she said she was not—it made no difference. It might be that the electricians were in fault in not better guarding the heater. Plaintiff's demand was very modest. If electric heaters were put into business premises, the owners did so at their own peril. The customers must be kept safe. Judgment for the plaintiff.

Electricity on Board Ship.—In a report on marine hygiene, the Assistant Medical Officer of Health for Liverpool insists upon the general introduction of lighting and ventilating by means of electricity, points that can now be dealt with by the standardisation of construction. Incidentally, he mentions that on very large liners one method which has had good results, and allows of several changes of air per hour in the cabins, consists in using four large fans, 5 ft. in diameter, driven by electric motors. These drive the fresh air from the upper deck into shafts suitably distributed. The air is sufficiently heated on entering, by means of steam coils, to allow the temperature of 60° F. to be maintained in the terminal distributing shafts. He proceeds to suggest that the exhaust fans for extracting the vitiated air from the cabins should be of smaller capacity than the blowing fans, to enable a slight internal pressure to be always maintained. It is, he says, very desirable that the lighting of living quarters should be more carefully arranged, and electric lighting has made a great improvement in the larger vessels.

The Supply of Platinum.—In 1916 the crude platinum mined in Colombia, estimated at 25,000 oz., was refined in the United States, and reports received from U.S. refiners show that 28,088 oz. of metals of the platinum group was recovered by them from all sources, foreign and domestic, of which 24,518 oz. was platinum (1 oz. troy = 31·1 gm.).

It is known that the Colombian deposits will be more extensively developed during 1917 than ever before, and it is estimated that at least 30,000 oz. of crude platinum, containing 85 per cent. metal, will be derived from that source. It is hoped that in 1917 deposits in the United States will yield more platinum than heretofore, that platinum derived from all sources other than foreign crude will exceed 7,000 oz., and that the production of crude platinum will be at least 10 per cent. greater than in 1916.

The Russian situation is very difficult, but it is known that there are considerable stocks of crude platinum held in Russia which are available to the Allied Governments. It is believed that the production from Russia in 1917 will be considerably increased, perhaps equalling the 1915 output (124,000 troy oz.).

The available supply of platinum in the United States appears to be adequate to meet immediate needs.—*Metallurgical and Chemical Engineering.*

Electrolytic Zinc.—A pamphlet published by the United State Geological Survey, relating to the output of zinc in the United States during 1916, contains a paragraph on the production of electrolytic zinc. The total capacity at the end of 1916 was not as great as the original estimate of the Survey, and instead of 60,000 tons, the actual rate of output was 40,000 tons per year. This fact was due to the delay in completing several plants. It is stated that when the plants now under construction are at work, the yearly capacity will be 85,000 tons. The actual output of electrolytic zinc during 1916 was 12,916 short tons, of which 1,800 tons was produced by refining prime western spelter, 887 tons was refined from scrap and dross, and 10,229 tons was produced direct from ores by leaching and electro-deposition. The total production of zinc in the United States during 1916 was 667,456 short tons. A table gives particulars of 11 electrolytic zinc plants in the United States. In writing of electrolytic zinc in North America, it is desirable to mention also that one of the most important plants is at Trail, British Columbia.—*Mining Magazine.*

The Engineers' Ballot on Dilution.—It will hardly be possible for the Ministry of Munitions to proceed with their scheme for enforcing dilution on private work in face of the engineers' ballot, which gave 45,000 votes against and only 8,000 for it on a voting membership of about 200,000. It may be expected that the Government will drop this feature of the Munitions Amendment Bill, and concentrate on carrying out dilution on private work, wherever possible, by agreement. The remaining provisions of the Bill, many of which anticipated specific recommendations by the Industrial Unrest Commissioners, will probably be passed into law without further delay.—*Times.*

U.D. Councils' Association and Electricity Supply.—At the quarterly meeting of the Executive of the Urban District Councils' Association, consideration was given to the evidence to be submitted to the Electric Power Supply Committee, and the following resolution was passed :—

That a Sub-Committee be appointed to consider the evidence to be furnished on behalf of the Association, it being the view of the Executive Council (1) that the future electricity supply of the country must be looked at from a national and not from a parochial point of view, the first consideration being a supply of cheap electricity ; (2) that it is essential that any scheme for the construction of large stations should secure a satisfactory supply of energy in bulk on fair terms to any local authority authorised to supply and desiring the same ; (3) that the profit of any bulk supply undertaking ought to enure for the benefit of the community ; and (4) that if any existing undertakings are taken over they should be acquired on equitable terms.

Volunteer Notes.—County of London Volunteer Engineers (Field Companies).—Headquarters, Balderton Street, Oxford Street, W.

Orders for the week, by Lieut.-Colonel C. B. Clay, V.D., commanding :—

Saturday, August 4th, to Sunday, August 12th.—Camp at Esher. During this period the Headquarters at Balderton Street will be closed, and will be removed to the Headquarters at the Camp, Claremont Park, Esher.

Musketry.—The range at Belvedere Road will be open on Tuesday, Wednesday and Thursday, August 7th, 8th and 9th, respectively, from 5.30 to 7.0.

Armlets.—The new issue armlets can now be obtained at Headquarters, and every enrolled man must obtain one without delay, and all old (red) armlets must be returned to the Orderly Room.

(By order) Macleod Yearsley, *Company Commander and Adjutant.*

B. of T. Committee on Electricity Supply.—The General Purposes Committee of the L.C.C. has recommended that Standing Order No. 177 be suspended so far as may be necessary to enable the confidential report of July 14th, 1914, by the Comptroller of the Council, the chief engineer, and Mr. C. H. Merz, on the question of London electricity supply, to be submitted in evidence before the Electric Power Supply Committee of the Board of Trade.

Zirconia as a Refractory Material.—The *Transactions* of the Ceramic Society, says *Nature*, contain an interesting article by Mr. J. A. Audley on this subject. The melting point of raw zirconia is in the neighbourhood of 2,000° C., that of the purified material being considerably higher. It can be both melted and volatilised in the electric furnace. It is a "neutral" substance of the same type as alumina, and is said to have a high resistance to the fluxing action of both acid and basic slags. Its heat conductivity is remarkably low, and its coefficient of expansion on heating is nearly as low as that of quartz glass, both of which are very valuable properties. It resists the action of fused cyanides and alkalis.

As a lining for electric arc furnaces the natural product is good enough, its high melting point, low thermal conductivity, and small coefficient of expansion making it particularly suitable for this purpose. Now that it is obtainable at comparatively reasonable prices, it can be used for the manufacture of refractory bricks.

Educational.—City and Guilds of London Institute.—The Department of Technology has issued the programme for 1917-18, containing the regulations for the conduct of classes and examinations of candidates in technological subjects, &c. It is announced that in the event of the continuance of war, it will not be possible to hold the examinations in Grade I and Final in Electrical Installation Work in 1918, and modfications may become necessary in other respects.

Appointment Vacant.—Assistant constructional engineer for the Birmingham Electric Supply Department. See our advertising pages to-day.

Bequest for Research.—The late Sir Charles Holcroft, Bart., ironmaster and colliery proprietor, bequeathed to Birmingham University £5,000 to establish a "Charles Holcroft Research Fund," the income to be applied to promote and encourage research work in Chemistry, Physics, Engineering, Mining, Metallurgy, &c.

Fatality.—The *Times* states that while chasing a crab on Southend Pier, on Tuesday, a boy, aged 11, stepped on the live rail of the electric tramway, and was killed.

Electrical Import Restrictions.—The Import Restrictions Department of the Board of Trade have under consideration, in consultation with the London Chamber of Commerce, Oxford Court, Cannon Street, London, E.C. 4, the granting of a concession allowing the restricted importation of the following goods :—(*a*) Electric dry cells ; (*b*) arc lamp carbons ; (*c*) searchlight carbons ; (*d*) battery carbons.. Firms who were importing these goods last year should communicate with the London Chamber of Commerce, asking for particulars as to the steps which should be taken to obtain licences.

The Ministry of Munitions and Gas.—In view of the paramount importance of meeting the increasing need for by-products obtained from the carbonisation of coal at gasworks, the Minister of Munitions wishes to impress upon those possessing gas-burning appliances the desirability of using gas in preference to any other means of obtaining light, heat, or power. At present an increased supply of gas can be provided without difficulty, inasmuch as during the summer months gas undertakings generally are in a position to manufacture in excess of the ordinary requirements of consumers.—*Daily Telegraph.*

It will be observed that this instruction is addressed specifically to "those possessing gas-burning appliances."

Electricity from Irish Peat.—It is announced that Mr. Keating, M.P., secretary of the Industries Committee of the Irish Parliamentary Party, has received an assurance from the Prime Minister that the representation as to adding to the Irish Committee on Peat a member with electrical experience will receive attention. The name suggested is that of Dr. J. F. Crowley, the Irish representative on the Board of Trade Committee which is investigating the sources of electrical power in the United Kingdom. It is claimed for him that he is possibly the only Irishman who has had extended practical experience of research on a large scale in relation to electrical engineering. An experiment in the production of electricity from peat is now being made, and it is held by expert authorities that in that direction mainly lies the best and most serviceable use of the vast reserve of peat stored in the Irish bogs.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station and Tramway Officials.—Hull Corporation tramways manager reports that Mr. J. Clappison, a member of the staff, has effected an improvement in the soldering irons used by the department. On the manager's recommendation, the Corporation has granted him an award of two guineas.

At the meeting of the Heston and Isleworth U.D.C., the Electricity Committee reported that the exemption of Mr. P. Rycroft, the electrical engineer, had been withdrawn by the Military. It was granted him as a whole-time official, but for two months he had been engaged partly in the Controller of Mines Department, and on that ground the certificate had been withdrawn. He could, however, the Munition Area Dilution Officer stated, obtain a protection card, Army Form W 3,476b, and the Committee recommended that this be done. A number of members objected to the recommendation. If the engineer was not necessary as a whole-time official he ought to be in the Army, being in Class A. Mr. Hales said that Mr. Rycroft early in the war declared his willingness to enlist. Let him do so now. Mr. Lobjoit said they had nothing to do with Mr. Rycroft's wishes. They had only to consider him as the responsible head of a valuable undertaking, where nearly all the rest of the staff had joined up. If a breakdown occurred there was no one who could set things right. Although with the Controller of Mines daily, the engineer could be got at at any moment, and the arrangement was that he was to be spared if absolutely required. The Committee's recommendation was agreed to.

Brighton Tramways Committee has increased the salary of Mr. Marsh, engineer and manager, from £400 to £500 a year, subject to the condition that the amount of the increase shall, during the time that he is acting as an Assistant Director of Shipyard Labour, be reduced by an amount equivalent to the pecuniary benefit derived by him from the allowance for expenses to be made to him by the Government.

The Bolton Electricity Committee has received the resignation of Mr. Robert Baker, superintendent of the fittings department, and passed a resolution expressing high appreciation of his services, and regretting that, owing to ill-health,

he deemed it necessary to retire. Mr. Baker is to continue in a consultative capacity at a salary of £62 10s.

Mr. F. French, deputy borough electrical engineer of Bridlington, has been appointed O.C. of Vol. R.E. (Signal) Section at Bridlington.

The Derby Electricity Committee has appointed Mr. G. H. Lake chief assistant engineer, at £250 per annum.

The Highways Committee of the L.C.C. reports that, in connection with the reorganisation of the Council's tramways department, applications were invited for the positions of rolling stock engineer and permanent way engineer at salaries of £1,000, rising to £1,200, and £800, rising to £1,000 respectively, no limit of age being prescribed. In response to the invitations, 32 applications were received for the position of rolling stock engineer, and 39 for the other appointment. After examining the applications, &c., the Committee does not feel justified in recommending the appointment of any candidate to the positions as advertised, and under the circumstances recommends:—

That Mr. W. E. Ireland, rolling stock superintendent in the tramways department, act temporarily as rolling stock engineer, and that while so acting he be granted, in addition to his salary (£325 a year), a special allowance of £225 a year; that Mr. H. S. May, assistant rolling stock superintendent in the tramways department, discharge temporarily the duties of rolling stock superintendent in the rolling stock branch as reorganised, and that while discharging these duties he be granted, in addition to his salary (£325 a year), a special allowance of £75 a year; that Mr. G. W. Knight, superintendent of the central car depôt, occupy temporarily the position similarly designated in the rolling stock branch as reorganised, and that while occupying this position he be granted, in addition to his salary (£300 a year), a special allowance of £100 a year; that Mr. J. B. Welling, permanent way engineer in the tramways department, occupy temporarily the position of head of the permanent way branch as reorganised, and that while occupying this position he be granted, in addition to his salary (£900 a year), a special allowance of £150 a year; that Mr. J. R. Wignal, technical assistant in the tramways department, act temporarily as a technical assistant to the permanent way engineer, and that while so acting Mr. Wignal be granted, in addition to his salary (£340 a year), a special allowance of £100 a year; and that, until further order, Mr. W. P. Farquharson, general assistant, do act in the position of chief clerk in the tramways department.

General.—Mr. A. P. Trotter, Electrical Adviser to the Board of Trade, after 21 years' Government service, is returning to professional practice as a consulting engineer. He is entering into partnership, as from October 1st next, with Messrs. Handcock & Dykes, under the style of Handcock, Dykes & Trotter. The offices of the firm will be at 11, Victoria Street, London, S.W.1. For the next six weeks Mr. Trotter's address will be "Coates Farm, Fittleworth, Sussex." Mr. Trotter, who is a member of the three leading engineering institutions, and president of the Illuminating Engineering Society, as well as vice-chairman of the National Illumination Committee of Great Britain, and chairman of the Joint Committee on Illuminating Engineering of the Department of Scientific and Industrial Research, was electrical engineer to the Government of Cape Colony from 1896 to 1899, when he became Electrical Adviser to the Board of Trade. His lifelong devotion to the study of illumination problems has placed him in the front rank of authorities on that subject; he was the originator of the dioptric type of glass shade, which at the time, unfortunately, could not be commercially manufactured, but now, in modified forms, is a very popular and highly efficient device, and, besides inventing various photometers and other scientific apparatus, he has made valuable contributions to the literature of light. As custodian of the Board of Trade electrical standards, Mr. Trotter was justly proud of their well-known precision, and the work done in the meter-testing department under his supervision was of the highest order. He was also responsible for the Electricity Supply Regulations of the Board of Trade, and in that capacity bore the brunt of the criticism which Government regulations invariably provoke. He did his utmost to smooth the way of applicants for leave to erect overhead mains, and himself developed the theory and effected valuable improvements in design. Few men in the electrical world possess a more genial personality or are more deservedly popular in the profession than Mr. Trotter, and his many friends will heartily join with us in wishing him every success in his new sphere of labour.

The marriage took place at Blackburn, last week, of Mr. Jas. Heys, electrical engineer, of Invergordon, where he is engaged with the Admiralty, and Miss Lizzie Bedford, of Blackburn.

Roll of Honour.—Captain C. Cecil Ellison, West Yorkshire Regiment, eldest son of Mr. C. H. Ellison, telegraph superintendent of the N.E. Railway, was admitted to a base hospital in France on July 24th, suffering from gas-shell poisoning and severe wounds, but he is progressing favourably.

Private J. C. Gold, formerly in the gutta-percha department of the India-Rubber Co., Silvertown, and Driver G. Springall, formerly in the general office of the same company, have both been wounded in France.

An evening paper states that Wireless Operator J. H. Holdenshaw, R.F.C., has been awarded the D.C.M., for erecting wireless apparatus when it had been shot down by the enemy.

Private E. W. R. Clarke, Middlesex Regiment, killed in action, was employed by the Ediswan Co., Enfield, N.

Private W. H. Pritchard, North Staffs. Regiment, who was engaged at Messrs. Siemens Dynamo Works, at Stafford, is reported killed in action, after being missing.

Corporal R. Davies, King's Shropshire L.I., who was an articled pupil at the Shrewsbury Borough electricity works, has died of wounds received in action at the battle of Loos in September, 1915.

Staff Sergeant-Fitter E. F. Hammersley, R.G.A., who has fallen in action, was on the staff of the Potteries Electric Traction Co., Stoke-on-Trent.

Gunner P. L. Cope, Howitzer Battery, who has died of wounds received in action, was with Messrs. Willans & Robinson.

Captain W. Downey, Staff D.A.A. of Ordnance, reported missing and believed to have been drowned, was, before the war, connected with the electrical engineering department of the Dublin Corporation.

Gunner G. Moorcroft, R.F.A., who has had to have both feet amputated, and who is 21 years of age, was employed at the Southport Corporation electricity works.

The death is officially reported of Private J. Wright, of the Loyal North Lancashire Regiment, who was employed in the offices of Messrs. Dick, Kerr, at Preston.

Temporary Lieutenant (acting Captain) R. G. Beer, R.E., who was before the war with the Chelmsford Electric Lighting Corporation, has been mentioned in General G. F. Milne's dispatch for distinguished service with the Saloniki Force.

Corporal G. F. Eden, Royal Marine L.I., who has been killed in action, was an electrician at the Hotel Metropole, Leeds.

Private J. Howarth, Durham L.I., who is reported killed, was employed as an electrician at Warrington.

Lieutenant Austin Vivian d'Andria, R.E., who has been awarded the Military Cross for gallantry, was an electrical engineer. He was in Constantinople at the outbreak of the war, assisting in the erection of a new works by an English firm.

Corporal E. Jackson, of the West Riding Regiment, who has been granted the D.C.M., was an electrician at the works of Messrs. R. F. Winder, Leeds. He was awarded the Military Medal four months ago.

Second-Lieutenant A. E. W. Butler, Royal Berkshire Regiment, reported killed after being missing for a year, served his apprenticeship with Messrs. Fraser & Chalmers, or Erith, and later was on the staff of Callender's Cable and Construction Co., Ltd.

First-Class Stoker G. Dewell, who was lost in H.M.S. *Vanguard*, was an employé of Messrs. Johnson & Phillips, Ltd., of Charlton, S.E.

Will.—According to the *Times*, the late Mr. Matthew Gray, of Lessness Park, Abbey Wood, Kent, and of the India-Rubber, &c., Co., of Silvertown, who died intestate, left £37,033.

NEW COMPANIES REGISTERED.

Voltalite, Ltd. (148,069).—Private company. Registered July 24th. Capital, £3,000 in £1 shares. Manufacturers of and dealers in self-generating electric cycle lamps, and other electric, cycle, or engineering appliances, manufacturers, importers, exporters, and shippers of and wholesale and retail dealers in games, toys, cycles, and fancy goods, &c. The subscribers (each with one share) are: H. O. Farrell, 99, Meadow Street, Moss Side, Manchester, electrical engineer; A. Lowe, 388, Manchester Road, Droylsden, cashier. The first directors are: H. O. Farrell and A. Lowe. Registered office: 91, Beverley Street, Moss Side, Manchester.

Enterprise Manufacturing Co., Ltd. (148,059).—Private company. Registered July 24th. Capital, £5,000 in £1 shares (2,500 pref.). Electrical merchants, suppliers on sale or hire of electric lamps and fittings, &c. Agreement with C. H. Roberts and H. Ashdown. The subscribers (each with one share) are: C. H. Roberts, 23, Acacia Road, Norbury, S.W., electrical engineer; H. Ashdown, 16, Landseer Road, Bow, E.3, electrical engineer. The first directors are: C. H. Roberts and H. Ashdown. Registered office: Gun Street Electrical Works, Bishopsgate, E.1.

Wedmore Engineering Co., Ltd. (148,050).—Private company. Registered July 23rd, by Johnson, Weatherall & Sturt, 7, King's Bench Walk, Temple, E.C. Capital, £100 in £1 shares. To acquire (by permission of the Board of Trade) the business of a company of the same name (the books and documents of which are liable to inspection under the Trading with the Enemy Act), and to carry on the business of mechanical and electrical engineers, founders, smiths, &c. No share may, without the consent of the Board of Trade, be held by or on behalf of any (present) enemy, nor may the directors, without such consent, allot or register the transfer of any shares which would cause more than 40 per cent. of the total issued capital, or more than 25 per cent. of the voting power, to be held by or on behalf of foreigners, foreign corporations, or foreign-controlled corporations. The subscribers (each with one share) are: S. G. Beaton, Branscombe, Woodcote Green, Wallington, engineer; G. H. Beaton, 41, James Square, Holland Park, N.W.11, engineer. The first directors are S. G. Beaton and G. H. Beaton. At least three-fourths of the directors, including the chairman, must be British subjects, resident in the United Kingdom. No (present) enemy may be a director or alternate director.

Cosmos Lamp Works, Ltd. (148,045).—Private company. Registered July 23rd, by Jenkins, Baker & Co., 17, Gresham House, Old Broad Street, E.C.2. Capital, £50,000 in £1 shares. To acquire (by permission of the Board of Trade) the undertaking of the Brimsdown Lamp Works, Ltd. (the books and documents of which are liable to inspection under the Trading with the Enemy Act), and to carry on the business of manufacturers of and dealers in electrical lamps, fittings, and appliances, &c. The articles of association contain provisions relating to British control, similar to those in the case of the Wedmore Engineering Co., Ltd. (q.v.). The subscribers (each with one share) are: A. Winterbottom, Denewood, Alric Avenue, New Malden, Surrey, accountant; F. B. Clarke, Bourn, Ewell Road, Surbiton, Surrey, accountant. The first directors are: N. B. Dickson, P. A. Lang, W. W. Blunt, G. Layton, and J. H. Tearle. Registered office: Westinghouse Building, Norfolk Street, W.C.2.

CITY NOTES.

Pernambuco Tramways and Power Co., Ltd.

Mr. F. Holt, presiding at the annual meeting recently, said that the company had a net increase of 10 per cent. in earnings, notwithstanding that the gas works were under reconstruction, that the tramways were being converted to electrical working, and that prices of coal and all materials were very high. During the year the exchange had been very much against them, but their result was not altogether unsatisfactory on the whole. The exchange was now better, and earnings continued to show steady improvement. If nothing unforeseen happened this year, they would be able to establish the renewal fund and, possibly, go a step further, but they must proceed cautiously in these difficult times. They had only touched the fringe of the electric light and power supply possibilities. During next year they hoped for good results from the development of that department of the business.

Indo-European Telegraph Co., Ltd.

The company's through telegraph service continued interrupted during 1916. Telegraphic receipts were limited to traffic traversing the eastern sections of the company's system. The new arrangement between the company, the Indo-European Telegraph Department, and the Eastern Telegraph Co., under which there would be secured to the company a sufficient sum, after payment of all expenses, to provide a dividend of 7 per cent. on the share capital, came into operation on August 1st, 1916. It would lie with the directors to recommend any additional dividend by drawing on the equalisation of dividends fund, but this was not called for in respect of 1916. The revenue from message account and other sources was £162,274, against £204,190 for 1915, a decrease of £41,916. The expenses on commercial and general account were £55,519, and on maintenance account £19,810, making a total of £75,329, a decrease of £6,889. After deduction of income-tax, and adding the amount brought forward, £80,073 is available, and out of this £40,000 is put to investment fluctuations, the interim dividend requires £10,625, the final dividend of 22s. 6d. per share (making 7 per cent. for the year) absorbs £19,125, and £10,323 is to be carried forward. With the final dividend mentioned, a distribution of 30s. per share was paid out of interest received, making a total for the year 1916 of £3 5s. per share, free of income-tax.

London United Tramways, Ltd.

On July 25th, at an adjourned meeting of the first mortgage debenture stockholders, Mr. M. W. Mattinson, chairman of the Committee of Debenture-Holders, made a full statement concerning the Committee's work. In addition to investigating the present position, they had tried to look farther ahead and to estimate the position of the company in the period after the war. Many things had been investigated, and they required the assistance of a person skilled in tramway construction and running to give his professional opinion to aid them. Such advice should be obtained without any avoidable delay. The Committee had been considering whether a solution of the future of the company, and their interest as debenture-holders therein, might not be found in some permanent arrangement with the Underground Co. or its associated companies. That was the only possible solution, but it was one first to be explored and considered. They had hoped to secure election to the board of two gentlemen nominated by the debenture-holders, but the board declined the request, although renewing their assurance to give every information that the Committee required. The Committee recommended that the bond-holders should authorise them to incur all necessary expense in obtaining professional and other advice. They would do their best to obtain expert assistance and such report as might be necessary upon the position and prospects of the system. The Committee was not a committee of investigation, and they did not propose to make any inquisition as to where the responsibility of the past lay. They were a committee of reconstruction, and their mission would be limited, as far as possible, to the rehabilitation of the company. A resolution was passed by the meeting authorising the employment of competent expert assistance. Lord Revelstoke, who presided, said that an opportunity might be taken to convey to the board an expression of the debenture-holders' opinion, inviting them to elect two gentlemen as representatives of the debenture-stockholders to join the board.

Yorkshire Electric Power Co.

Satisfactory progress is reported for the half-year ended June. The revenue has increased and, notwithstanding the higher cost of coal and labour, the net profit is larger. The net profit, after payment of bank and other interest, for three June half-years has been: 1917, £17,617; 1916, £13,550; 1915, £9,873. The half-yearly dividend on the 6 per cent. cum. pref. shares is to be paid on August 1st, but in view of the financial conditions arising out of the war payment of a dividend on the ordinary shares is deferred until the accounts are made up for the year. The new 6,000-kw. turbo-alternator will shortly be running on load. In consequence of increased demands for current, it has been found necessary to place on order a further unit of the same size, for which space was provided in the new engine house at Thornhill. Of the recent issue of £71,640 of 6 per cent. cum. pref. shares, £42,845 has been taken up, leaving £28,795 still available. Numerous applications have been received during the past half-year.

British Thomson-Houston Co., Ltd.

Mr. H. C. Lewis presided at the annual meeting, on Monday. He said that the total number of employés who had enlisted was 1,309, and, quoting the figures given in the report as to those who had fallen or had won distinction, he said that the company had a fine record in this matter. They did not recommend the payment of dividends, as it was deemed wise to use the surplus profits for further depreciation of the goodwill and plant accounts. The goodwill was brought down by a further £40,000, leaving it at £60,000. They had expended £88,535 on plant. The total writing off from plant for the year was £116,000. Holdings in shares and debentures of other companies were valued very conservatively. Their profit, for the year involved heavy payments to the Government, but they were glad that circumstances were such that their contribution could be so large. Last year they made a reserve of £25,000 to take care of possible depreciation in raw material, but this year they wrote it back, and used it for other depreciations, because it was not required, and as it was proposed under the Finance Bill that they would have two years within which to liquidate their stock of raw material, there was little danger of making a loss in that connection. The loan from the General Electric Co. of New York had increased by £57,000.

Marconi's Wireless Telegraph Co., Ltd.

The net profits for 1916, including the balance brought forward, after providing for expenses of management, depreciation, and all other expenses, were £625,960. After paying 12 per cent. on the preference shares and 15 per cent. on the ordinary for the year, £412,576 remains, of which £32,470 is to be transferred to general reserve account, and £380,106 is to be carried forward. The general reserve account will now stand at £1,000,000. Larger dividends are not recommended as, in view of the demands for apparatus and material likely to be made upon the company on the cessation of hostilities and the uncertain financial outlook, the directors deem it prudent to strengthen its financial position. Shares in associated companies and patents are taken into account at their cost price, as usual, and they stand at £1,403,923, an increase of £20,266. The par value of the shares now stands at £2,487,451, exclusive of shares which have no capital denomination. Owing to unfavourable rates of exchange large sums of money have been invested temporarily or placed on deposit abroad. The loss represented by the rates of exchange calculated on December 31st, 1916, has been written off against profit and loss account. In the event of ultimate realisation without loss, the amount so written off will appear as profit in another year. The company is still without any remuneration or compensation from the Government for the use since the beginning of the war of the company's high-power stations and for other relative services. Moreover, the company has not yet been afforded an opportunity of considering any proposal as to the basis upon which either remuneration or compensation is to be calculated. For the third year in succession, therefore, it has been impossible to include any sum in respect of these matters in the accounts. A number of orders have, however, been received by the company from Government Departments in respect of which payments have been duly made. The four heads under which considerable sums are payable by the Government were set out in the directors' report last year, as follows:—

1. Remuneration and compensation by the Post Office in respect of the use of the company's high-power stations since the beginning of the war, the staffing and management of those stations, and other services in connection therewith.

(Under the above claim the company has been repaid part of its out-of-pocket expenses, but the expenditure incurred is considerably in excess of the payments received.)

2. For the use of the company's patents by the Admiralty since the expiration, on March 31st, 1914, of the Admiralty agreement of 1903.

(Shareholders were informed last year that the company had received the assurance that the matter would be dealt with as quickly as possible. This assurance has been repeated.)

3. In respect of the use of the company's patents by the War Office, without agreements, during the whole time wireless telegraphy has been used by the War Office.

(The War Office has informed the company that this matter cannot be dealt with until after the war.)

4. For compensation by the Post Office in respect of their withdrawal from the contracts for the Imperial chain of stations.

(There have been repeated negotiations with a view to a settlement of this matter, which are still proceeding.)

The Marconi International Marine Communication Co., Ltd., has continued to show a substantial development in its business and increased profits. Dividends for the past year amounting to 15 per cent. have been declared. The company has taken steps to increase its authorised capital to £600,000.

The Russian company, the Société Russe des Télégraphes et Téléphones sans Fil, has continued to do a large business, and a dividend at the rate of 17 per cent. for 1916 has been declared.

The French company, La Compagnie Française Maritime et Coloniale de Télégraphie sans Fil, has declared a dividend for 1916 at the rate of 12½ per cent. on the ordinary shares and 140.62 francs on the founders' shares.

The Amalgamated Wireless (Australasia), Ltd., has paid a dividend of 5 per cent. in respect of the year ending June 30th, 1916.

The net income of the Marconi Wireless Telegraph Co. of America for 1916 was $259,888, as compared with $177,316 for the previous year, and the total surplus now carried forward amounts to $801,776. The very large orders now being executed on behalf of the Government of the U.S.A. have necessitated the construction of considerable additional factory accommodation. The American Trans-Atlantic stations which were expected to constitute the principal source of revenue have remained idle in consequence of this company's stations continuing to be employed by the Government. A very satisfactory telegraph service was being conducted from the Pacific Coast across the Pacific Ocean to the Hawaiian Islands and Japan up to the time the United States entered the war, when the Government took possession of the stations. Negotiations were immediately opened, and are progressing rapidly towards settling the basis of the payments to be made to the company, and final agreement is expected to be reached promptly.

Since the last report submitted to the shareholders, the action brought by Messrs. O. Locker-Lampson and Peter E. Wright has been discontinued. In view of the unconditional withdrawal by the plaintiffs of all charges, the company and its directors agreed not to look to them for the payment of their costs, which will be borne by the company. Mr. H. W. Allen and Mr. W. W. Bradfield, who have been associated with the company since its inception, have been elected to the board. Mr. M. A. Bramston, a director of associated companies, has joined the board. Annual meeting: August 9th.

Austrian Companies.

The Hungarian Siemens-Schuckert Werke report gross profits of £177,000 for 1916, and net profits of £24,000.

The directors of the *Ver. Telefon und Telegraphen Fabriken A.G. Czeija, of Vienna*, recommend a dividend of 12 per cent. for 1916, as contrasted with 9 per cent. in the previous year.

The report of the *Gesellschaft fur Elektrische Industrie, of Vienna*, states that the works were fully occupied in 1916, particularly in the production of machines and transformers, owing to the growing demand for direct and indirect war orders. An extraordinary increase in the cost of raw materials, wages, and general expenses took place, especially in the second half of the year, and it was becoming visibly accentuated. It was only possible in a few cases to raise the sale prices of manufactures to a corresponding extent. The net profits are returned at £28,000, as against £16,000 in 1915, and a dividend of 10 per cent. is proposed, as in the preceding year.

The A.E.G.-Union Elektrizitats Gesellschaft, of Vienna, states that the shops were crowded with work in 1916, and many orders remained unfilled. Apart from contracts for the Army authorities, the collieries and ironworks, and the munition factories, numerous orders were received for the chemical industry in connection with the cyanamide works in course of erection. The gross profits are reported to amount to £200,000, as compared with £183,000 in 1915, and the net profits to £75,000 and £46,000 respectively. It has been decided to distribute 8 per cent. on the increased share capital of £833,000, as against 6 per cent. on £666,000 in 1915.

The Oesterr. Siemens-Schuckert Werke A.G., of Vienna, report that the great technical requirements for the war had converted the company's departments on the whole into electrotechnical war shops, and had almost entirely excluded works for peace purposes. Most departments were engaged on urgent orders throughout 1916, but operations were hampered by the scarcity of trained and expert workmen, and the length of the shifts had consequently to be extended, and to be supplemented by night shifts in so far as it was technically possible. As a consequence, the customary careful overhaul of the machinery and plant had to be restricted, and a considerably greater depreciation took place. The gross profits amount to £780,000, as compared with £611,000 in 1915. After meeting general expenses and other charges, and placing £104,000 to depreciation, as against £68,000, the accounts show net profits amounting to £126,000, as contrasted with £118,000 in 1915. It is proposed to distribute 7 per cent. on share capital of £1,333,000, the same rate as in the previous year.

London & Suburban Traction Co., Ltd.—It is not proposed to pay an interim dividend on the preference shares for the half-year to June 30th.

Hong-Kong Tramway Co., Ltd.—Dividend, 9 per cent., less tax (interim).

National Gas Engine Co., Ltd.—Interim dividend at the rate of 5 per cent. per annum, less income-tax, on the preference shares, and 7½ per cent. per annum, less income-tax, on the ordinary shares for the June half-year.

North London Railway Co.—Interim dividend, 2 per cent. for the half-year.

Bristol Tramways & Carriage Co., Ltd.—Interim dividend at the rate of 5 per cent. per annum for the June half-year on the ordinary shares.

Metropolitan Railway Co.—Interim dividend at the rate of 1 per cent. per annum on the ordinary stock. Interim dividend on the Surplus Lands Stock at the rate of 2½ per cent. per annum.

Charing Cross, West End & City Electricity Supply Co., Ltd.—Interim dividend on the ordinary shares of the West End undertakings for the June half-year at the rate of 4 per cent. per annum.

Westminster Electric Supply Corporation, Ltd.—Interim dividend at the rate of 8 per cent. per annum, less income-tax, for the half-year ending June 30th.

Russia.—The Wolframite Co.'s statutes have been approved. It will operate in Transbaikalia. Capital, 200,000 roubles.

The Russian Regional Electrical Stations Co., capital 4,000,000 roubles, closed its (1916) working year with a profit of 523,263 roubles. It will pay 4 per cent., as in the previous year.

The statutes of the Russian Accumulator Co. have been approved, capital 2,700,000 roubles. This company was formed to take over the Russian "Tudor" Accumulator Factories, Petrograd.

France.—The Mediterranean Electrical Co. (L'Energie Electrique du Littoral Méditerranéen) is increasing its capital, owing to the development of war requirements, from 38 to 60 million francs (from £1,520,000 to £2,400,000). Formed 17 years ago to develop and supply electrical energy in the Mediterranean region of France, its operations have been greatly expanded under the stimulus of war. Its earnings, which in 1914 amounted to 7,583,000f., rose to 11,032,000f. in 1916, and this year are expected to reach 13,000,000f. The dividend last year was 6 per cent.—*Times*.

A new company has lately been formed in Paris with a capital of £6,000, and the title La Société du Secteur Electrique de la Rue d'Angouleme. La Société Hydro-Electrique de la Maurienne, of Paris, has also recently increased its capital to £400,000.

STOCKS AND SHARES.

Tuesday Evening.

Stock Exchange business has not given any sign of revival from the quietude into which it dropped when the Russian crisis became acute. Cheerfulness is shown by Brazilian issues in consequence of a brisk rally in the Rio rate of exchange. Industrials still command the greater part of what business there is in the markets. The Marconi Co. has raised its dividend from 10 per cent. to 15, but the shares are unchanged.

It is inevitable that memories should dwell just now upon the changes wrought by exactly three years of warfare on the colossal scale. The Stock Exchange is naturally looking up its 1914 records and prices. Some of the latter we quoted here last week. Electric Railway stocks have shared in the general depression which Home Railways have been unable to escape during the period, depression broken by few and brief spurts of strength. Most Mexican bonds and stocks have fallen very heavily, those of the electrical power companies with the rest. It would not be fair, of course, to lay all the blame for this weakness at the door of the war, although without a doubt the war has been a prominent factor.

Electricity supply shares are lower on balance. The companies have had peculiar penalties to pay as their share of the war, the Daylight Saving Bills and the lighting restrictions being two of them. We ring some of the changes that have occurred during the three years in this table:—

Share.	July 27, 1914.	Now.	Rise or fall.	Share.	July 27, 1914.	Now.	Rise or fall.
Brompton ..	9¼	6¼	—2¾	Kensington ..	7¼	5¼	—2
Brush 1st deb. ..	54½	61	+6½	London ..	1 1/16	1	— 1/16
Ditto P. Lien ..	83½	77	—6½	Metropolitan ..	3¼	2¼	—1
Charing Cross ..	5¼	3¼	—1	Notting Hill pref.	9¼	8	—1¼
Ditto pref. ..	4¼	3¼	—1	St. James's ..	9¼	6¼	—3
Chelsea	4¾	2¾	—2	South London	3 1/16	2¼	— 13/16
City	16	12⅜	—3⅝	South Met. ..	⅞	1 1/16	+ 3/16
County	12	11¼	— ¾	Westminster ..	8¼	5⅞	—2⅜
Edmundson's 1st Deb.	89½	69½	—14	Ditto pref. ..	6¼	3 1/16	—1 15/16

South Metropolitan ordinary shares have more than doubled in price, but the two preference issues are down, and the 4½ per cent. debenture stock has dropped from 98½ to 81, a fall of 17½ points.

The Marconi report shows the company to be in a strong financial position, and, as already mentioned, the dividend is to be raised from 10 per cent. to 15 per cent. Some disappointment is felt, however, at the absence of any Government payment even yet for the services rendered by the company since the outbreak of war, though it is taken for granted that information on this head will be forthcoming at the eagerly-awaited meeting. Meanwhile, the shares remain at 3¼, and the speculative investor is said to be quietly picking them up.

Mr. McKenna's recent threat of a further advance in the income-tax has diverted fresh attention to securities upon which the dividends are at present distributed net. Underground Income bonds have accordingly recovered a point of their last week's drop of 4. India-Rubber shares put on 10s.,

the yield still coming to the equivalent of over 10 per cent., less tax. Eastern Telegraphs are up 2, and Eastern Extensions 2s. 6d. Other cable issues are mostly strong. Oriental Telephones have gone back ½ after their too rapid rise. Chile Telephones are better to the extent of the ex dividend marking last week.

Brazilian Tractions have responded to a spurt in the Rio rate of exchange. At 50, the price shows a fall of 16 as compared with July 27th, 1914; this is a small shrinkage, having regard to the fact that in those latter days the company was paying 6 per cent. on the shares. British Columbia stocks are flat, the 4½ per cent. debenture being 2½ lower on the week, and 41½ down since three years ago. The preferred ordinary at 30½ has fallen no less than 75½, and the deferred 79½, since the outbreak of war. Mexico Tramways Firsts are 48 points to the bad; all other Mexicans have suffered severely.

London and Suburban Traction preference are weak at 6s. 6d., the board having decided to pass, or postpone, payment of the interim dividend due now. The dividend is cumulative. An interesting report is just published by the Indo-European Telegraph, the company whose direct line crosses Germany. Net profit has fallen away by £27,000, to £59,100, and the dividend would be reduced to 7 per cent., as against 13 per cent., were not the latter rate maintained by the addition of 6 per cent. from interest received. The dividend has now been 13 per cent. for 13 years.

Manufacturing shares are steady. Babcock at 3 1/16 are 1/16 up; the price was 2½ three years ago. British Insulated have risen 2½ in the war period; British Westinghouse preference 10s., Callenders 2½, Henleys £1, and India-Rubbers £4. Curiously enough, Telegraph Constructions at 38½ show no net change at all.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1915.	Dividend 1916.	Price July 31, 1917.	Rise or fall this week.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	10	9	6½	—	£8 16 6
Charing Cross Ordinary	5	5	8½	—	7 2 10
do. do. do. 4½ Pref.	4½	4½	8¾	+ ½	6 13 4
Chelsea	4	3	5½	—	5 4 4
City of London	8	8	12½	—	6 5 6
do. do. 6 per cent. Pref.	6	6	10	—	6 0 0
County of London	7	7	11½	— ½	6 4 5
do. 6 per cent. Pref.	6	6	10	—	6 0 0
Kensington Ordinary	7	10	8½	—	5 11 7
London Electric	3	3	1	—	Nil
do. do. 6 per cent. Pref.	6	4	8½	—	5 6 8
Metropolitan	8	8	24½	—	6 0 0
do. 4½ per cent. Pref.	4½	4½	3½	—	7 4 0
St. James' and Pall Mall	8	8	6¾ xd	—	5 0 9
South London	5	5	3½	—	7 5 6
South Metropolitan Pref.	7	7	21/6	—	6 10 3
Westminster Ordinary	7	7	8½	—	6 1 9
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	97½ xd	—	6 2 9
do. Def.	22/6	1½	22½	—	6 16 4
Chile Telephone	6	6	7 xd	+ 3/16	5 14 4
Cuba Sub. Ord.	5	5	8½	—	5 17 8
Eastern Extension	8	8	14½	+ ½	*5 11 4
Eastern Tel. Ord.	8	8	143½	+2	*5 11 6
Globe Tel. and T. Ord.	7	7	15½	—	*5 9 10
do. Pref.	6	6	10½	+ ½	5 15 8
Great Northern Tel.	22	24	86	—	6 18 4
Indo-European	13	13	33½	+1	6 8 10
Marconi	10	15	3½	—	4 15 10
Oriental Telephone Ord.	10	10	22	—1/9	8 14 5
United R. Plate Tel.	8	8	6¾	—1/8	*6 0 9
West India and Pan.	6d.	6d.	1/3	—	1 12 0
Western Telegraph	8	8	14½	—	*5 10 4
Home Rails.					
Central London, Ord. Assented	4	4	6½	—	6 10 1
Metropolitan	1	1	23½ xd	—	4 9 0
do. District	Nil	Nil	15½	—	Nil
Underground Electric Ordinary	Nil	Nil	1½	—	Nil
do. do. "A"	Nil	Nil	6/6	—3d.	Nil
do. do. Income	6	4	81	+1	*4 19 0
Foreign Trams, &c.	Dividend				
	1915.	1916.			
Adelaide Sup. 6 per cent. Pref.	6	6	5	—	6 0 0
Anglo-Arg. Trams, First Pref.	6½	5½	3½	—	9 11 4
do. 2nd Pref.	6½	—	2½	—	—
do. 5 Deb.	5	5	69	—	7 6 6
Brazil Tractions	4	4	50	+ ½	—
Bombay Electric Pref.	6	6	10	—	6 0 0
British Columbia Elec. Rly. Ptcs.	5	5	50½	—2	9 19 0
do. do. Preferred	Nil	Nil	30½	—1	Nil
do. do. Deferred	Nil	Nil	27½	—	Nil
do. do. Deb.	4½	4½	55	—2½	7 14 7
Mexico Trams 5 per cent. Bonds	Nil	Nil	26	—	Nil
do. 6 per cent. Bonds	Nil	Nil	39	—	Nil
Mexican Light Common	Nil	Nil	14½	—	Nil
do. Pref.	Nil	Nil	24½	—	Nil
do. 1st Bonds	Nil	Nil	39½	—	—
Manufacturing Companies.					
Babcock & Wilcox	15	15	3 3/16	+1/16	4 17 10
British Aluminium Ord.	7	10	30	—	6 13 4
British Insulated Ord.	17½	20	19½	—	7 15 0
British Westinghouse Pref.	7½	7½	3 1/16	—	5 17 2
Callenders	20	20	14½	—	7 0 6
do. 5 Pref.	5	5	4½	— ½	6 1 8
Castner-Kellner	22	22	8 1/16	—	6 10 2
Edison Swan, fully paid	—	—	1½	—	Nil
do. do. 4 per cent. Deb.	4	4	70½	—	5 18 6
Electric Construction	7½	7½	4½	—	8 0 0
Gen. Elec. Pref.	6	6	10½	—	6 6 0
do. Ord.	10	10	15½ xd	—	6 9 0
Henley	25	25	15	—	7 16 8
do. 4½ Pref.	4½	4½	4	—	5 12 6
India-Rubber	10	10	13	+ ½	*7 13 10
Telegraph Con.	20	20	38½	—	*6 5 2

* Dividends paid free of income-tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, August 1st.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	1/6	..
a Ammoniac Sal	per ton	£75	..
a Ammonia, Muriate (large crystal)	"	£84	..
a Bisulphide of Carbon	"	£20	..
a Borax	"	£38	..
a Copper Sulphate	"	£61	10/- dec.
a Potash, Chlorate	per lb.	2/6	..
a " Perchlorate	"	2/-	..
a Shellac	per cwt.	105/-	..
a Sulphate of Magnesia	per ton	£15	..
a Sulphur, Sublimed Flowers	"	£25	..
a " Lump	"	£20	..
a Soda, Chlorate	per lb.	10½d.	..
a " Crystals	per ton	120/-	..
a Sodium Bichromate, casks	per lb.	..	..
METALS, &c.			
c Brass (rolled metal 2' to 12' basis)	per lb.	..	..
c " Tubes (solid drawn)	"	..	..
c " Wire, basis	"	..	..
c Copper Tubes (solid drawn)	"	1,7½ to 1/8½	½d. dec.
g " Bars (best selected)	per ton	£160	£5 dec.
g " Sheet	"	£160	£5 dec.
g " Rod	"	£160	£5 dec.
d " (Electrolytic) Bars	"	£137	£5 dec.
d " " Sheets	"	£182	£5 dec.
d " " Wire Rods	"	£145	£5 dec.
d " " H.C. Wire	per lb.	1/6½	½d. dec.
f Ebonite Rod	"	3/-	..
f " Sheet	"	2/6	..
a German Silver Wire	"	2/3	..
h Gutta-percha, fine	"	6/10	..
h India-rubber, Para fine	"	3/0½	1½d. inc.
i Iron Pig (Cleveland warrants)	per ton	Nom.	..
l " Wire, galv. No. 8, P.O. qual.	"	£42	..
g Lead, English Pig	"	..	..
g Mercury	per bot.	Nom.	..
e Mica (in original cases) small	per lb.	6d. to 3/-	..
e " " " medium	"	3/6 to 6/-	..
e " " " large	"	7/6 to 14/- & up.	..
d Silicium Bronze Wire	per lb.	1/0½	½d. dec.
r Steel, Magnet, in bars	per ton	..	..
g Tin, Block (English)	"	..	..
n " Wire, Nos. 1 to 16	per lb.	3/6	..

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
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r W. F. Dennis & Co.

American Copper Output.—It is estimated that the copper refineries of the United States turned out about 185,000,000 lb. of copper during the month of May. This was through maintenance of about the same basis as in April, when the yield was 180,000,000 lb., allowing for a 3 per cent. increase on account of the extra day. There has been no close approach to the December record of 200,000,000 lb., which was the result of combined efforts of the country's refining plants in the closing month of last year. New refinery capacity has been gradually completed, and much of the expansion programme among the various plants has yet to be carried out. Despite the fact that capacity will be somewhat in excess of 200,000,000 lb. monthly, it will be largely a "paper" capacity with equipment held in reserve against delays that may occur at other portions of plants. During the past two years there has not been a bit of idle equipment, and the result has been that, under forced pressure and operation for such a long period, there will have to take place considerable replacement work. In the opinion of some of the refinery officials the country's refined copper yield will range in the future between 180,000,000 and 190,000,000 lb. monthly, and, upon occasion, possibly 200,000,000 lb. With the lower estimates fulfilled, the refineries will be caring for every pound of raw product that will have been shipped from the mines.

Interruptions to mine operations in the winter months, reflected by smaller receipts at refineries 60 to 90 days later, will be offset in the summer months by extreme heat at the refineries, making impossible full operation.

Another factor in keeping down the yield from refineries continues to be found in the inefficiency of labour. The highest wage scale ever paid, instead of making better workmen, has the opposite effect among the refinery employés, and it now takes 30 hours to perform work ordinarily handled in 24.—*Electrical Review and Western Electrician.*

A New Insulating Material.—A new patent insulating material, which, it is claimed, is hard, almost incombustible, and non-absorbent, can be moulded and wrought, and is suitable for replacing porcelain, marble, slate, and vulcanised substances, has been described in *Industria é Invenciones*. It is composed of pulverised asbestos, 52 per cent.; sifted mica, 14 per cent.; "mineral caoutchouc," 20 per cent.; rubber solution, 10 per cent.; sulphur, 3 per cent.; and resin, 1 per cent. These proportions are approximate, and may be varied.

THE POSITION OF THE ENGINEER IN NATIONAL AFFAIRS.

At a special meeting of the American Institute of Electrical Engineers, the President, Mr. H. W. Buck, delivered an address on this subject. The following abstract is based upon the *Electrical World* report:—

The change and improvement in the engineer's position in the world in recent years have been so rapid as to surprise even those who were the optimists in the under-dog days of the engineering profession. The engineering profession is coming into its own. A flood of scientific and technical accomplishment has swept over the face of the earth, revolutionising life, commerce, and international destinies.

In all this development period of the engineering profession during the last century the engineer has worked his way along alone and in silence, so to speak, seeking his reward rather in the joy of accomplishment and in the realisation of his dreams than in worldly recognition and accumulation. The very inherent greatness of the pioneers who have laid the foundations upon which we now build prevented them in a way from acquiring a more worldly position in affairs. This tradition, however, is not a virtue beyond a certain point, and the engineer by nature is too willing to give way to others. The time has come when he should take a more worldly position in the world which he himself has created.

In our general relations to intellectual development we may consider that we are just emerging from a classical period where tradition, custom, prejudice, ignorance, and dogmatic religion were the controlling forces. Movements which took place in world affairs were largely political, following the paths best suited to the advantage of the ruling classes. There was little real progress, because there was no development of scientific knowledge and its application in engineering. Scientific truth held no standing. The worship of tradition caused a powerful reaction against any scientific discovery which might necessitate a readjustment of established habits of thought and life.

A constant change in point of view, which is so largely brought about through developments in scientific knowledge, seems to be necessary for progress in civilisation. Our civilisation to-day differs from that of a century ago in proportion to the scientific and engineering evolution which has taken place during the period through its reactions on life in all of its phases. Such discoveries in science as the law of gravitation, the evolution of species, the laws of electromagnetic induction, &c., have probably had a more profound effect upon the development of the human race than any other acts in history.

The engineering profession has passed through the preliminary stages of its growth, and has reached a position where the engineer should work and act, not only with proper attention to his work itself, but with full consciousness of the important relation of his work to human affairs in general. Among the early pioneers in engineering were many notable instances of men of great breadth of view. Of recent years, however, under the stress of commercial development and economic conditions, increasing specialisation has taken place and the engineer has become obliged to compass his mind with an ever-narrowing horizon. This specialisation produces extraordinary proficiency in particular fields, but has the objectionable effect of narrowing the character and outlook of the man, and of reducing his value as a citizen. We must take care lest commercial considerations and the modern mania for efficiency in the narrow sense force our engineers to lose sight of the world around them in their concentrated attention to the part rather than to the whole. This excessive specialisation is a danger which threatens the future standing of the engineer.

It is interesting to recall in this connection the results of a recent canvass made by a joint committee on education on the qualities which, in the opinion of about 5,000 leading men, engineers and others, best fit a man for a successful career as an engineer. As a result of this vote, only 13 points out of 100 were assigned to purely technical knowledge as an essential, the other 87 points being allotted to broader qualifications, such as judgment, character, human understanding, &c. This is merely a quantitative statement of the many general demands now being made of the engineer, and it illustrates how his work has broadened out. It is an interesting and encouraging symptom.

A most significant movement of recent times in the engineering world has been the development of co-operative action among engineers of all classes, and this tendency will, I believe, serve to offset the evils of specialisation. It is the growing recognition of the fact that all branches of engineering are interdependent. We electrical engineers, I believe, are well aware how much we need the assistance of other branches of engineering for the successful fulfilment of our purpose.

This co-operative movement has quite recently been given tangible expression in the formation of the Engineering Council, an act, I believe, of far-reaching consequence. Under this organisation, as a beginning, the Civil, Mechanical, Mining, and Electrical Societies, together with the United Engineering Society, are tied together for co-operative action through a joint body of 24 representatives. This body will meet at frequent intervals, and will deliberate on matters of general interest to engineers. It is an encouraging beginning toward universal co-operation among engineers in all branches of work.

In this Engineering Council we have for the first time an engineering body, representing about 30,000 engineers, of sufficient scope and standing to create an engineering public opinion. Its influence is likely to be far-reaching in building up the prestige of engineers in both technical and civic affairs. A further development which has reached full recognition only in recent times is the mutual appreciation which has grown up between the engineer on the one hand and the worker in pure science on the other.

The engineer looks to the scientist to provide him with raw materials of knowledge with which to work out his applications, and the scientist must look to the engineer to make his discoveries so fruitful that the full effectiveness of his work on the frontier of research can be sustained. Both are working together in order to unfold nature in the most effective way for the benefit of man.

All of the important movements taking place at the present time which centre around the engineer and his work mean, I believe, that the engineer is soon going to leave his position of isolation in independent fields of work and realise that he owes an obligation to the community broader than his daily engineering work, and will contribute to the general welfare his talents and experience. It matters not whether the problems before him are political, sociological, industrial, or technical; I believe that the engineering type of mind, if the proper breadth of view has been acquired, is best fitted to undertake them.

It is not necessary, perhaps, in important administrative positions to have civil, electrical, or mechanical engineers as such, but we do need men in those positions who have had training of the type which engineering gives, with the mental balance, the power of analysis which such a training develops, the resourcefulness and the faculty of recognising and properly apportioning the various elements in a problem. There is a quality of mental honesty which engineering experience highly develops which is sorely needed in public life. The scientific and engineering professions should rise up and furnish such men from their ranks for the welfare of the country.

I believe that we can confidently look forward to a new era for the proper fulfilment of the destinies of the engineer. Out of this world chaos we now see men of engineering and scientific training rising to positions of commanding prominence on all sides. It is simply the working of the inevitable law of the survival of the fittest.

In this great movement not only must the individual engineer play his part, but the great engineering societies must realise the power of influence which they are developing in an ever-increasing degree in the community at large, and the obligations which devolve upon them.

And so I hope that the American Institute of Electrical Engineers, as it passes along from one administration to another, will acquire an increasing realisation of its duty, not only in furthering the growth of science and engineering, but in furthering the influence of the engineer in the affairs of the country and of the world.

A NEW INDUSTRIAL LEAGUE.

(*Concluded from page* 81.)

Mr. George H. Roberts, M.P., said that the greatest of all the problems that would have to be dealt with after the war would be the problem of the relationship of employer and employed. The war would have had a tremendous effect on the whole of our system of society. We should have dissipated tremendous wealth; should have lost even more in flesh and blood than in material things; and we should have to face great problems of recuperation, reconstruction, and trade expansion if our country was to retain its hold on the markets of the world. The great question before us was: "How is our country to maintain its commercial position of eminence?" In his view, if the old disputations remained, if employers and employed were ranged in conflicting camps, the ravages of war would not be repaired, reconstruction would be impossible, and as sure as night followed morn, so would the decline and fall of the British Empire set in unless they were able to solve the great question then under discussion. He had always been an agitator, but he felt that if his views ought to be modified in any way, he claimed that human quality of courage to express such modification. He had come to the conclusion that many of the things he hoped for in the days of his youthful enthusiasm were not going to be achieved merely by the hoping. Those great human problems were not going to be solved by the application of any heavenly alchemy. Human problems had to be worked out by human beings, and therefore mistakes would always be made; but they must risk those mistakes in order that they might gradually grope their way to a better and more perfect state of things. Those who had been associated with their movement had recently been immensely heartened. He

had something to do with the setting up by the Government of a sub-committee of the Reconstruction Committee to deal with the problem that mainly concerned them—the relationship of employer and employed. They rejoiced to know that men of varying views, men who, before the war, could never have agreed on any one subject, had agreed to sit round a table to discuss this problem, and had submitted recommendations. Holding diverse views, they had unanimously submitted recommendations in accord with the fundamentals of the movement. They recognised that after the war there would be a great need for industrial harmony. They perceived that unless the employer and the employed worked together in friendly co-operation the history of the British Empire must be cut very short. Men with extreme labour views had joined with employers of orthodox opinion, and, if acted upon, their recommendations would do a great deal towards rehabilitating our country, and helping to promote a friendly feeling and clear understanding between the various industrial classes of the community. They desired to further the recommendations of the Whitley Committee. He had no illusions. The interests of employers and employed would never be identical any more than the principle of nationality or the interests of buyer and seller would be identical, but up to a certain point there was a community of interest. They proposed to develop the movement which was represented in the Industrial League. They believed that by its development they would be conferring a substantial advantage on the country, and they were going to develop as from that night. He would like to see a Director of Industrial Harmony appointed. He wanted to impress on employers and those who had influence with them the need of recognising that mere expressions of sympathy were not going to tend to the pacification of the working classes. They had to produce substantial results. The working classes were impressed with the belief that they got plentiful promises but no substantial results. If they wanted to establish industrial harmony in this country they had to show that, by that policy, substantial results would accrue not to one but to every class in the community. He was certain that if they pursued that policy then, just as before the war there was industrial chaos, so in the days when peace was restored they would be able to say that industrial cosmos had emerged.

Sir Archibald Denny remarked that he entirely sympathised with the idea of getting the employers and employed together. In the old days the works were smaller, and they knew their own men much better. The principle of his own firm was that those who came to rule in the works must have served their time through the works. When he began his time they had payment by results in the iron trades; his elder brother introduced payment by results. That system had continued ever since, and he thought theirs were the only works in the kingdom where piecework in the joiners' shop of a shipbuilding yard was practised before the war. In 1877 they wanted to introduce the system into the carpenters' shop, but the men would not have it, and they struck. They were afraid that their rates would be cut as soon as their output was discovered. That was quite a natural fear. After the strike had lasted some time the men said that if they would give them an assurance that rates would not be cut they would accept the system. They did that, with the result that the system was continued ever since, and had been perfectly satisfactory. He had great faults to find with employés. It was very difficult for the employers to deal with the trade union leaders, because they were never quite sure whether they could deliver the goods. That difficulty arose from the fact that, either from force of circumstances or from their own management, there had been created a power inside the unions which seemed to dominate the situation. Their leaders had always to take a vote before anything could be decided, and that was not very useful. The leaders were quite strong enough to carry their points in discussion with the employers, and were a good deal cleverer, therefore they ought to be able to deliver the goods. Credit was a great thing, and if they shook it, then there would be neither money nor anything else. They had to produce the goods as cheaply as they could. If there was a rise in wages and no rise in production, then they would not be a bit better off. They had to produce things more cheaply than they had ever done before, and then they would be in that state of comfort which they all desired. No one approved of low wages. Why did we pay them? Because we had competition, and competition with the foreigner was as hard as it could be, but there was also competition amongst ourselves in this country. He was not speaking as a syndicalist. It was cheap things they wanted to produce, and then they would all be as comfortable and happy as the day was long.

The Rt. Hon. F. Huth Jackson, the next speaker, said that, personally, he entirely supported the recommendations of the Whitley Committee, but the execution depended upon the goodwill and the co-operation of the employer and employed. So far as he could see at the present moment, that co-operation was by no means such a certainty as he should wish it to be. He had been associated with another movement which had objects similar to those of the movement represented there that night. For what they were worth they were perfectly willing to co-operate with any other movement which had the same object in view, and to co-operate in the most wholehearted manner for the achievement of the end which was so much desired. He very strongly deprecated any idea of competition between this movement, their movement, and any other movement for promoting more amicable relations between employers and employed. It would be a national disaster if they had organisations which, while having the same object in view, were working on different lines, and he therefore hoped (and he felt perfectly certain of it as far as his movement was concerned) that the spirit of co-operation would be present. They wanted co-operation, not competition.

Mr. G. Wardle (Acting Chairman of the Labour Party) said that if he were to focus in a sentence what was the result of the present meeting, he would say that they felt that something must be done to prevent an industrial war after the present war. He was not going to blind them to the fact that there was a considerable amount of underlying suspicion which hit the labour people as hard as it hit the employer. He was anxious for the sake of the future of the country, and for the sake of the workmen, as well as the employers, that something should be done to stop what was going on now. It could not be stopped by force, but it could be stopped by convincing the worker that the next step, whatever might be the ultimate step, was to secure co-operation between the employers and employed in order to bring about a better state of affairs. Everyone worked for mixed motives, but if their motive was unselfish within reason it could be done. That meeting might be historical, but the thing would not have to stop there, and they would not have to deal with Labour leaders only; they would have to go down to the men. They would have to get the men together. It was not always the fault of the men that there was no co-operation. They did not get the chance. Let them understand what was at stake. He could see what was happening—they could not. He could do his bit, but only at great risk and under great suspicion. If they wanted to destroy the seditious spirit that was abroad amongst a certain section in the country the only way they could do it was by absolute frank openness between themselves and their employés.

Mr. Blain proposed a vote of thanks to the Chairman. Mr. W. A. Appleton (secretary of the General Federation of Trade Unions) seconded, and Mr. Lee Murray briefly responded.

ELECTRIC VEHICLES IN SHEFFIELD.

In the discussion on Mr. Priestley's paper (Elec. Rev., July 20th, p. 55), before the Institute of Cleansing Superintendents, for a report of which we are indebted to *The Surveyor*, the author remarked that they might assume that a horse cost 13s. 6d., and that a motor vehicle would replace two horses without any additional rent. If they had horses and two drivers replaced by one vehicle and one driver, it was a paying concern. His experience had shown that so far as Sheffield was concerned the best point for electrics for refuse collection was a total journey from depôt to depôt of about three miles. If the journey was less than that distance they thought that horses could do the work slightly cheaper than electrics.

The President (Mr. Terry) said that Nottingham corresponded almost exactly with Sheffield in its local conditions, and the figures obtained from the working were almost identical, but he differed somewhat from Mr. Priestley with regard to the three-mile limit. The first two vehicles which Nottingham obtained were three-ton vehicles, and they had some journeys covering five miles. He presented some figures to his Committee in March last, and worked out the whole of the working cost, and the total amount of refuse collected, and compared the average cost per ton with the average cost per ton of horses worked throughout the city. Taking the two farthest distances and the two nearest distances, he thought that the cost showed a fair average for the city, and, compared with the average cost for horses' work, these figures for three vehicles from October, 1915, to February last showed an average cost per ton of 4s. 4.7d., and for four vehicles an average cost of 4s. 1.4d., while the average cost per ton of the horse vehicles was 5s. 1.3d. per ton. That was showing a considerable saving in favour of electrics.

Ald. W. Roberts (Liverpool) said that, as the members knew, he always believed in horses. But he had had the opportunity of reading Mr. Priestley's paper on electric vehicles, and evidently, from the figures, these vehicles had worked remarkably well. In Liverpool they had a large number of horses, between 300 and 400, and a number of petrol-driven vehicles, for their engineer believed that they could run a petrol-driven vehicle much cheaper than an electric. For certain distances he believed that horses were more economical, but there seemed no doubt that for long distances the petrol vehicle, or the electric, could beat the horse. Everything depended in connection with these petrol-driven or electric-driven vehicles on getting them loaded quickly and lightened quickly. They must always keep them working to make them pay.

Mr. W. Greig (Glasgow) said Mr. Priestley told them that in Sheffield each man and horse cost 13s. 6d. a day. He thought that was extremely low. In Glasgow it cost 16s. 6d., but, on the other hand, in Glasgow they got more work out of their horses. In the next table, about electric vehicles,

Mr. Priestley said that he was guaranteed a 10-years' life for the vehicle, and he went on to say, "One half the cost of the vehicle is represented by the battery, and this is guaranteed to give 100 per cent. of its original efficiency after eight years' continuous service, and any defects due to misuse are made good by the makers during such period." In Glasgow they purchased an Edison battery vehicle, and they were only given a guarantee of four years on 40,000 miles, with 90 per cent. for the next year, and 80 per cent. on the remaining year, so that he thought the estimate here should have a five years' life instead of ten. But, notwithstanding this, the cost of electric vehicles in Glasgow for collection and haulage was 3s. 10d. per ton, and for horses 4s. 2d. per ton.

Ald. C. C. Elliott (Newcastle) said that he had had 25 years' experience of haulage with steam and petrol wagons. There was nothing to challenge the electric vehicle for intermittent work and varied loads, and the house-to-house deliveries to a distance of three miles. Take an electric car to carry two miles, however, and they would find that a petrol car worked out cheaper than the electric. They were also doing short work, and loading about a mile and a half, and the cost of the horse cart compared with the petrol, or the electric, or the steam vehicle, was higher. But he did not think that they could lay down a general law. For long distances over six miles they could not beat the steam wagon for loads of five tons and upwards. The horse would always have its place in the very short distances.

Mr. R. Diggle (Accrington) said that in Accrington they had had one of these vehicles for about two months, and the distance they had to carry their stuff was within a radius of two miles. He could assure the conference that the electric vehicle had come to stay, and that if they could get another they would have one next week. The vehicle was bringing in about 20 loads a day. It had had the advantage of being in competition with the horse, and the horse had been doing more work because of the competition. They had reduced the cost per ton by 1s. Besides that, they had a system of bonuses; the men had been earning more money, and were quite satisfied. In the short distances the electric vehicle would compete very favourably with the horse.

Mr. T. Stake (Stoke-on-Trent) had seen a three-tonner and a two-tonner on the previous afternoon, and was very pleased with the ease with which the thing was manipulated; but he thought that the body was built far too heavy to carry two tons of house refuse. These bodies would be quite capable of carrying anything from five to seven tons of any kind of material.

Mr. H. Hopkinson (Portsmouth) said he had not the slightest doubt about the accuracy of Mr. Priestley's figures. He foresaw a big extension of this business, and although he was a horsey man, and had many horsey men on the committee, they had changed their policy. They had got almost *carte blanche* now. His committee was perfectly satisfied that they had beaten the horse off the face of the earth as regarded the collection of refuse.

Mr. Priestley, in reply, said with regard to the cost of bringing in a motor when it broke down with a load, he had had a good deal of experience, and he considered that it formed an infinitesimal proportion of the cost. To know that he had got four years more guarantee on his battery than Mr. Greig had been able to get for his delighted him. One or two references had been made to the question of the three-mile limit. Referring to the conditions which obtained in Sheffield in the collection of bin refuse, their experience was that they loaded and got away rapidly—where the refuse was already out in the street—and the figures for loading showed that the electric could beat the horse at any distance. No time was lost in charging. The vehicles were charged in the depôt at night between the day and the night service, and when they came in for meal times, either during the night or during the day, if necessary. He did not agree that the weight of the body was in excess of what was required. The tire wear depended on the conditions of the district. Their tire wear was very much in excess of the tire wear in Nottingham. Mr. Terry had had his vehicles at work since October, 1915, and had only recently renewed. In Sheffield they had renewed more than once, but they had an arrangement with the tire manufacturers to work them on bare maintenance cost, and the prices that were given per mile were what they were paying for the maintenance of their tires.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

Donovan's Patent Combined Switch, Wall Socket, and Plug.

The problem of connecting portable apparatus to a permanent source of supply has occupied the thoughts of electrical manufacturers for a number of years, but their principal efforts have been directed towards the production of a convenient, small, and artistic design of wall plug and socket suitable for use in private houses. With the introduction of portable electrical apparatus into factories this problem has assumed difficult proportions, and with the publication of the Home Office Regulations governing the use of electricity in factories, the problem has been still further complicated.

To comply fully with the requirements of the Home Office Regulations, and also with the requirements of factory engineers, it has been necessary to design a wall socket and plug which, while being of thoroughly sound mechanical construction, provides that :—

(*a*) The wall socket must be combined with a multipolar switch, by means of which the tubular contacts in the socket may be rendered "dead."

(*b*) The plug must be so interlocked with the switch and socket that it is impossible to insert the plug while the switch is "on" and the tubular contacts "live," and it must also be impossible to withdraw the plug unless the tubular contacts are "dead."

(*c*) The multipolar switch must break contact on each pole.

(*d*) The apparatus must be efficiently earthed, and it must be impossible to break the earth unless all the contacts are rendered "dead."

(*e*) The plug having been withdrawn, it must be impossible for anyone to turn the switch on and thus make the tubular contacts in the socket "live."

(*f*) The apparatus must be so constructed that when necessary it can be rendered absolutely water-tight, and it should also be so constructed that when necessary it can be rendered flame-proof for use in mines.

Messrs. Donovan & Co., 47, Cornwall Street, Birmingham, have recently designed and patented a unique type of wall socket and plug, which, while possessing great mechanical strength, fulfils all the above requirements.

The socket and switch are enclosed in a cast-iron case, which can be rendered water-tight and flame-proof. The switch is of the multipolar type acting on each plug contact, and is so arranged that when the plug is withdrawn the contacts are "dead," and cannot become "live" unless the plug is inserted.

The mere act of inserting the plug does not operate the switch, as has been the case in all previous designs. In the design under notice the plug is provided with a key, which operates the switch by turning to the right or left, and the plug is so arranged that it cannot possibly be withdrawn unless the switch is in the "off" position, and, further, if the switch and socket were removed from the case, and the switch were put on before being returned to the case, it would be impossible to insert the plug.

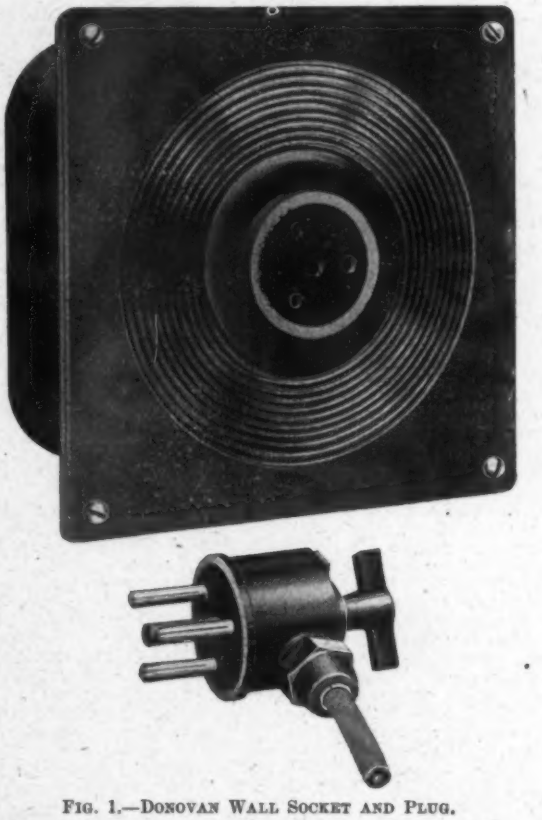

Fig. 1.—Donovan Wall Socket and Plug.

The switch is of the quick-break rotary type, with absolutely free handle arranged so that the switch cannot be held in semi or partial contact. Both the socket and plug are each made of a solid block of ebonite, thoroughly shrouded in a massive metal case. It is claimed that the whole of the apparatus is, in addition to being a perfect electrical device, a thoroughly sound mechanical article, which immediately appeals to the trained engineer.

This type of apparatus is specially suited for use in factories, shipyards, ironworks, motor garages, coal mines, and on steamships, and no doubt it will also be largely used in theatres in connection with stage lighting and heating.

A Handy Motor Ladder.

We are indebted to Mr. L. L. Horrell, assistant electrical engineer to the municipality of Pretoria, for the photograph here reproduced, showing a "motor ladder" outfit which the electricity department is using. Pretoria is one mile wide and seven miles long, and has 4,600 consumers, all of whom, with the exception of a few in the centre of the town, are fed off overhead bare-copper mains run on 36-ft. steel poles.

This motor ladder is used for getting to the consumers quickly for disconnecting, connecting, and attending to "All lights out." Since the outfit was put in commission, seven months ago, it has

FIG. 2.—MOTOR-CYCLE LADDER.

averaged 1,000 miles per month, and has saved the department in wages alone over £70, besides giving a better service.

As will be seen, the chassis is attached to a 6-H.P. Royal Enfield motor-cycle. The weight of the load on the chassis is 260 lb. The bicycle takes the hills without the least difficulty, and runs well. The department has had no expenses besides ordinary running costs; the whole outfit cost £120, and will therefore pay for itself in the first year.

A Telephone Battery Economiser.

With telephones of the newest and most economical type, with respect to battery consumption, the loss from 20 listening telephones is not less than 8·4 watts, and as this energy comes from dry batteries, the loss is equivalent to burning about thirty 25-watt Mazda lamps on 10-cent current, not counting the cost of installing the batteries in the telephones.

It is not uncommon to find telephones fitted with older transmitters where the cost of the current waste, because of one receiver off the hook, exceeds that of burning three 25-watt lamps at 10 cents per kilowatt-hour.

THE KELLOGG SWITCHBOARD & SUPPLY CO., of Chicago, is advising telephone companies that it has a remedy in a battery saver that is new and certain in service, is purely mechanical, can be installed by anyone on any Kellogg telephone, and is the final solution of battery waste. Furthermore, the cost of installing the battery savers is nominal. The battery saver consists of one piece and one attaching screw.—*Telephone Engineer.*

The R.B. "Adamant" Electric Pipe-Lighter.

This device, which has been put on the market by MESSRS. ROSE BROS., of 25—27, Milton Street, E.C., is the outcome of efforts to produce an electric pipe-lighter that will stand up to the every-day usage of the smoke room to which these lighters are subjected. The name "Adamant" has been given to it owing to the burner (patented) with which the lighter is fitted. This burner looks like a disk of stone, which is set in the end of a metal tube. The burner becomes red-hot in about four seconds after switching on the current, the consumption being 1·2 amperes. The burner will not burn out whilst one watches it—on the contrary, it will run for hours; hence continual replacements are not necessary. It will work on either direct or alternating current, the standard voltages ranging from 100 to 250 volts. It is small and compact, having an outside diameter of only half an inch, enabling it to reach down readily to the bottom of a pipe. The lighting of a cigar or cigarette offers no difficulty. The lighter also has the further advantage of not presenting a great volume of heat near the face of the user.

The "Adamant" pipe-lighters are made in two classes, the wall set and table set, and are connected by flexible cord to a plug for a wall socket or an adapter for a lamp.

The Channel Tunnel.—Mr. Arthur Fell, M.P., Chairman of the House of Commons Channel Tunnel Committee, has addressed a letter to the Prime Minister enclosing a request signed by over 110 members of all parties in the House of Commons, asking him to afford an opportunity for ascertaining the opinion of the House upon a motion standing in his name with regard to the Channel Tunnel.

NEW PATENTS APPLIED FOR, 1917.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & CO., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

10,242. "Rotary electric switches." A. A. BUCK. July 16th.
10,243. "Electric heaters." A. A. BUCK. July 16th.
10,246. "Sound filters, telephone receivers, gramophones, &c." C. TEASDALE, BUCKELL. July 16th.
10,269. "Electric circuit breaker or interrupter." H. SOUTHON. July 16th.
10,279. "Electrical apparatus for detecting and indicating position of submarines." M. B. PARKER & S. H. PARKER. July 16th.
10,317. "Illuminating devices containing electric incandescent lamps." BRITISH THOMSON-HOUSTON CO. (General Electric Co., U.S.A.). July 17th.
10,321. "Signalling by means of vibrating matter." W. WILLCOX. July 17th.
10,325. "X-ray localisation." SIR J. M. DAVIDSON. July 17th.
10,332. "Electric recording apparatus for controlling heats." R. SIRA. July 17th.
10,335. "Electric hot-plates for use on ships." F. P. FLETCHER. July 17th.
10,354. "Portable dry-battery electric torches." M. H. GLADSTONE. July 18th.
10,357. "Winding of armatures for electric generators, motors, &c." P. C. JONES. July 18th.
10,363. "Ignition plugs and manufacture of same." W. A. CLARK, H. G. LONGFORD, W. W. LONGFORD & SPHINX MANUFACTURING CO. July 18th.
10,365. "Electrical heating elements for cooking, &c., apparatus." A. F. BERRY. July 18th.
10,372. "Thermo-ammeters." WESTON ELECTRICAL INSTRUMENT CO. July 18th. (U.S.A., July 27th, 1916.)
10,379. "Extracting zinc by the electrothermal process." E. S. BERGLUND. July 18th. (Sweden, September 5th, 1916.)
10,389. "Method of preventing tramcar trolley leaving overhead wires." A. RICHINSON. July 19th.
10,403. "Accumulators for miners' portable electric lamps, &c." C. H. JOHNSON & SONS AND S. SALT. July 19th.
10,410. "Pocket lamp or torch." C. WEST. July 19th.
10,423. "Cord grips for electrical conductors." C. G. M. BENNETT. July 19th.
10,443. "Device for guiding trolley pulley of electric car into contact with overhead wire." E. B. MOTSE. July 20th.
10,448. "Electric radiators." SIMPLEX CONDUITS, LTD., & L. M. WATERHOUSE. July 20th.
10,472. "Magnets." L. SATCHWELL AND A. WEST & CO. July 20th.
10,511. "Electrical induction furnaces for heating and melting electrical conducting materials." J. K. EXTER. July 21st.
10,525. "Radio-controlled torpedoes." A. E. ERICSON. July 21st.

PUBLISHED SPECIFICATIONS.

1914.

14,441. TELEPHONIC RECEIVER AND TRANSMITTER BOXES WITH PHONOGRAPHIC STYLES. Seclau & Newman. September 1st, 1913.

1916.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

6,079. ELECTRIC SWITCHES. P. L. Davies & J. H. Woolliscroft. April 28th, 1916. (107,397.)
7,392. ELECTRIC IGNITION OR SPARKING ARRANGEMENTS. Siemens Bros. and Co., W. A. Bristow & H. W. F. Ireland. May 24th, 1916. (107,399.)
8,907. MOTOR HORNS. A. F. I. Forbes. June 24th, 1916. (107,408.)
9,165. MEANS FOR CONTROLLING SPEED OF AN ELECTRIC MOTOR. Marconi's Wireless Telegraph Co. & G. M. Wright. June 29th, 1916. (107,425.)
9,183. PRODUCTION OF CYANOGEN COMPOUNDS. A. R. Lindblad. June 29th, 1916. (107,426.)
10,096. SPARK GAPS FOR USE IN WIRELESS TELEGRAPHY. E. Girardeau and J. Bethenod. July 21st, 1915. (100,957.)
10,174. DYNAMO-ELECTRIC MACHINES. British Thomson-Houston Co. (General Electric Co., U.S.A.). July 19th, 1916. (107,439.)
11,623. ELECTRIC FURNACES. D. F. Campbell and Soc. Electro-Metallurgique Française. August 16th, 1916. (107,465.)
11,684. SUBMARINE ELECTRIC LEAKAGE TELEGRAPHY. Signal Ges. March 16th, 1915. (Addition to 13,919/13.) (101,223.)
12,016. ELECTROMAGNET SWITCHES. British Thomson-Houston Co. (General Electric Co., U.S.A.). August 24th, 1916. (107,472.)
12,352. AUTOMATIC TRAIN-CONTROL SYSTEMS. W. V. Turner. April 1st, 1916. (105,324.)
13,487. GALVANIC BATTERIES. J. E. Preston. September 22nd, 1916. (107,485.)
13,545. INTERLOCKING MECHANISM OF RAILWAY SIGNALS AND AUTOMATIC INDICATORS WORKING IN CONJUNCTION THEREWITH. J. T. Roberts. September 25th, 1916. (107,489.)
13,767. ELECTRIC SWITCHES. V. Hope. September 28th, 1916. (107,493.)
14,293. MEANS FOR SUPPORTING LENGTHS OF WIRE, PARTICULARLY APPLICABLE TO LINE INSULATORS. Bullers, Ltd., & G. V. Twiss. October 7th, 1916. (107,497.)
15,597. COMMUTATORS FOR DYNAMO-ELECTRIC MACHINES. V. M. Allen. November 1st, 1916. (107,512.)
15,829. ANCHORAGE FOR TRAMWAY RAILS. J. Gordon. November 6th, 1916. (107,517.)
16,492. SPARK GAPS. L. A. Kuntzman. November 17th, 1916. (107,520.)
17,061. RESILIENT PIVOTAL CONNECTION BETWEEN AN ALTERNATING-CURRENT ELECTROMAGNET AND ITS ARMATURE. Akt. Ges. Brown, Boveri et Cie. January 1st, 1916. (103,641.)

1917.

930. AUXILIARY APPARATUS FOR TELEPHONES. F. C. C. V. Naser & N. A. J. Lillendahl-Petersen. January 20th, 1916. (103,490.)
2,161. INSULATION OF ELECTRICAL MACHINERY AND OTHER APPARATUS. C. H. Klyne & C. J. Baker. February 13th, 1917. (Addition to 7,186/16.) (107,544.)
3,657. ELECTRIC MOTOR CONTROL SYSTEMS. British Westinghouse Electric and Manufacturing Co. March 13th, 1916. (105,329.)
3,568. TRANSFORMATION OF SINGLE-PHASE ALTERNATING ELECTRIC CURRENTS INTO POLYPHASE CURRENTS. British Westinghouse Electric & Manufacturing Co. March 13th, 1916. (105,330.)
4,047. OZONE GENERATORS. Ozonair, Ltd., & E. L. Joseph. March 20th, 1917. (107,556.)
6,945. HEATING APPARATUS. N. E. Brookes (Good Inventions Co.). May 30th, 1916. (Divided application on 7,645/16.) (107,571.)